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December - 1931

Santa Fe Locomotive 5000 Shows High Sustained Power

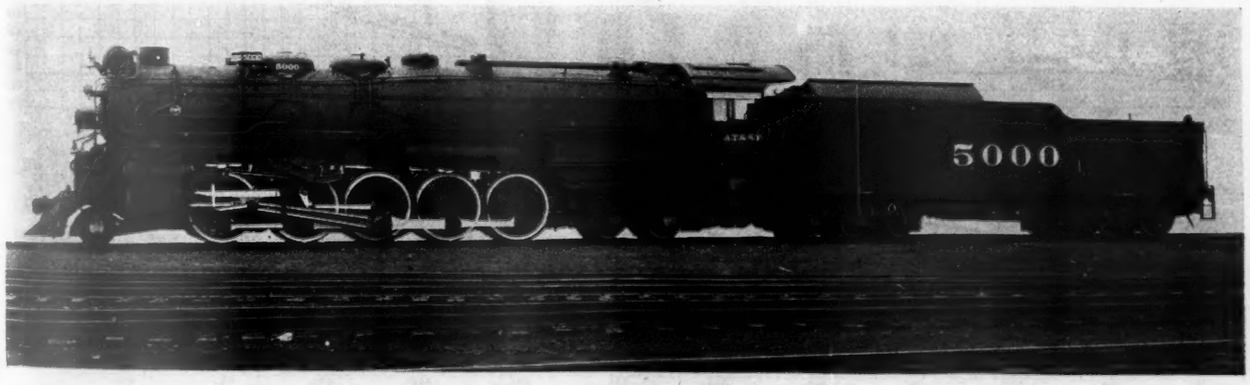
THE Atchison, Topeka & Santa Fe received a modern 2-10-4 type locomotive, No. 5000, from the Baldwin Locomotive Works in December, 1930, and placed it in service at Clovis, N. M. Subsequently, during the months of July and August, this locomotive was tested with a dynamometer car in freight service on the Pecos division between Clovis, N. M., and Belen, Since Locomotive 5000 was the only one involved in this test, comparisons can be made only with previous tests of other locomotives. As compared with Santa Fe 2-10-2 type locomotives of the 3800 class, for example, tested in the summer of 1930, the new locomotive will handle approximately 15 per cent more tonnage in 9 per cent less time and with 17 per cent less coal per 1,000 gross-ton-miles.

When compared with motive power which was considered strictly modern only about five years ago, therefore, the new Santa Fe 5000-class locomotive promises not only to effect important savings in fuel but to permit handling heavier train loads on shorter schedules. The resultant marked reduction in train-hours per ton handled, tendency to eliminate overtime, and minimizing labor and fuel costs due to delays will have a highly favorable effect upon operating expenses. In addition, the important objective will be achieved of giving better service to shippers.

Develops drawbar pull of 82,500 lb. at 15 m.p.h. and 50,000 lb. at 33 m.p.h., equivalent to 4,350 drawbar-horsepower

Locomotive 5000 is designed with a greater ratio of boiler capacity to tractive power than is generally used. It is of the 2-10-4 type; carries 300-lb. boiler pressure; and is limited to 60 per cent maximum cut-off. The main steam valves have 3-in. steam lap, ⅛-in. exhaust lap and maximum travel of 9-27/32 in. forward and 9⅜ in. backward motion.

Special equipment is as follows: Type E superheater; American multiple throttle; Elesco feedwater heater, located on top of the smoke arch; Elesco C. F. pump, located on the left side under the cab deck and back of the left trailer wheels; Standard stoker; Walschaert

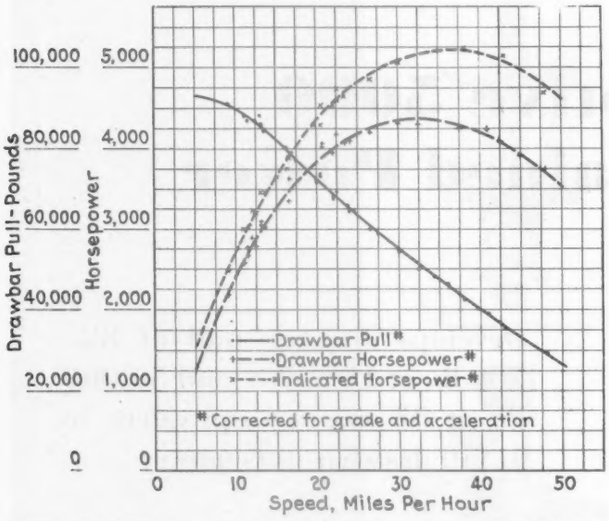


Santa Fe locomotive No. 5000 tested on the Pecos division

valve gear; Ragonnet reversing gear; Chapman-Lanning auxiliary starting valves; Chicago mechanical lubricator; two Nicholson Thermic Syphons in the firebox and one in the combustion chamber; two 8½-in. cross-compound air pumps, located under the smoke arch inside the line of the main valves and supplied with superheated steam; round-hole table grates, and Muchnic sectional bullring packing, with three sets of bronze rings on each piston head. The engine truck has outside journal bearings. The main rods are of the Lima tandem type. Drawings of the front-end and firebox arrangements are included. The general characteristics and dimensions of the locomotive are shown in a table.

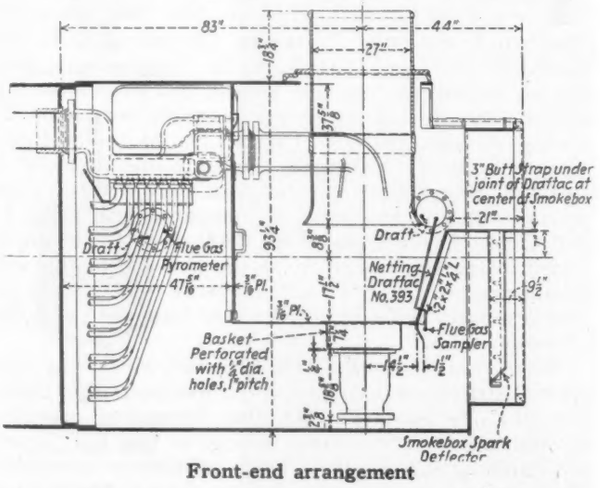
General Characteristics and Dimensions of Santa Fe Locomotive 5000

General classification	2-10-4
Service	Freight
Fuel	Coal
Tractive force, lb.	93,000
Weight in working order, lb.:	
Locomotive:	
Engine truck	41,100
Drivers	348,200
Trailer	113,300
Total	502,600

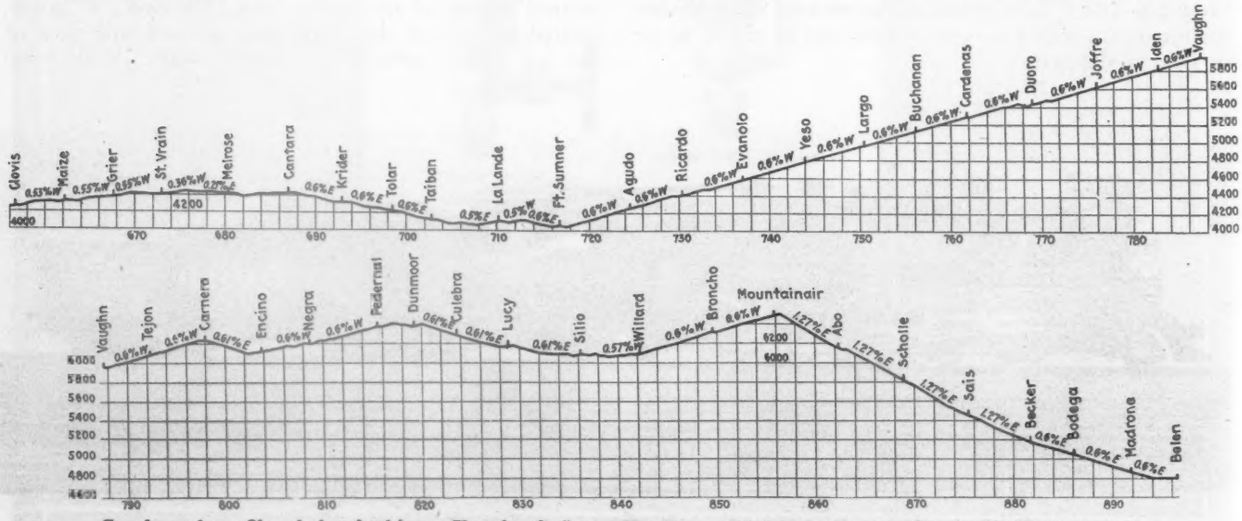


Power performance curves of Santa Fe locomotive No. 5000

Tender	283,000
Total, locomotive and tender	877,600
Boiler:	
Diameter, in.	104
Working pressure, lb. per sq. in.	300
No. of 2¼-in. flues	61
No. of 3½-in. flues	350
Length between flue sheets, ft.-in.	21-0
Firebox:	
Length, in.	162
Width, in.	108
Grate area, sq. ft.	121.5
Diameter of stack, in.	27
Number of arch tubes, 3½-in.	2
Number of thermic syphons:	
Firebox	2
Combustion chamber	1
Heating surface, sq. ft.:	
Firebox	443
Arch tubes	22
Syphons	127
Flues, 2¼ in.	750
3½ in.	4,770
Total evaporating surface	6,143
Total superheating surface	2,550
Cylinders:	
Diameter, in.	30
Stroke, in.	34
Piston rod diameter, in.	6
Driving wheel diameter, in.	69
Valves:	
Diameter, in.	15
Maximum travel, in.	9 27/32
Steam lap, in.	3
Exhaust lap, in.	⅛
Exhaust nozzle, Layden, four 3¾ in., later changed to 3⅞-in. openings, equivalent to 7½ and 7¾-in. single nozzles	
Dimensions of journals, in.	
Main	14½ by 13
Front, lateral motion	12 by 14
Others	12 by 13
Trailers	9 by 14
Engine truck	8 by 14
Tender 6-wheel truck	7 by 13
Tender:	
Capacity water, gal.	20,000
Capacity coal, tons	27

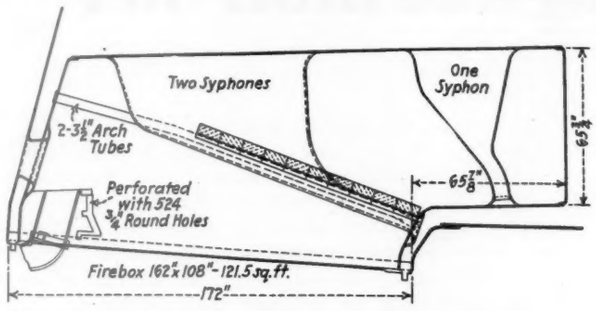


Front-end arrangement



Condensed profile of the Atchison, Topeka & Santa Fe, Pecos Division, between Clovis, N. M., and Belen

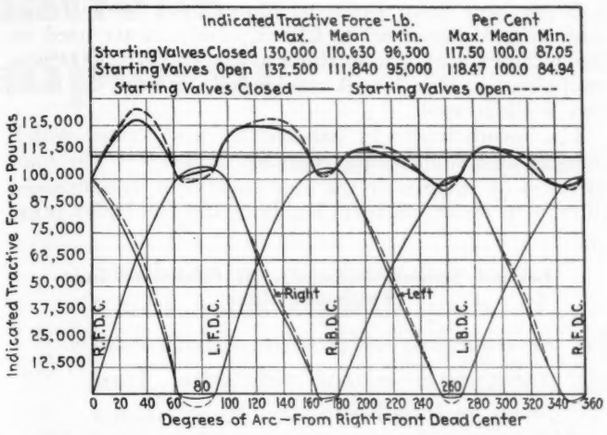
The Sante Fe dynamometer car was used to record drawbar pull, speed, rate of firing, rate at which water was supplied to the boiler, air-brake operations, and time



Cross section showing the large firebox and combustion chamber equipped with three Thermic Syphons

of passing stations, starting and stopping. Cab readings included boiler pressure, steam-chest pressure, back pressure, position of the throttle, reverse gear, temperature of superheated steam entering the valves, temperature of smokebox gases, and the readings of a valve pilot, a device applied by the Valve Pilot Corporation which kept a record of the speed and position of the reverse gear.

Crosby steam-engine indicators were used to determine the steam distribution in the cylinders, and two 4-in. hot-water meters were used, one on the suction line of the pump and the other on the injector, to record the amount of water delivered by either, which was recorded on the chronograph chart. Check readings were also made by means of gage boards on the tender. An electric contact was attached to the stoker conveyor



Indicated tractive-force diagram for locomotive No. 5000

which recorded the revolutions. Temperatures were taken of the feedwater before entering and after leaving the feedwater heater. The amount of cinders thrown from the stack was determined by a catcher in the form of a sector placed over the stack covering about 1.95 per cent of the area, diverting the cinders caught into a container. From the amount of cinders caught, the total amount discharged was determined.

The coal consumption was determined by leveling the top at the beginning of a trip, filling to the same level at the end, and taking the weights shown by the coal-chute scales.

The test was made on the first and second districts of the Pecos division between Clovis and Belen. The ruling grade is 0.6 per cent westbound. Eastbound it is

General Performance of Locomotive 5000 in Freight Service Test Runs on the Pecos Division of the Santa Fe

Run No.	Duration of test: Total time hr.—min.	Duration of test: Running time hr.—min.	Average speed m.p.h.	Train stops, total	TRAIN: Cars ld.	TRAIN: Cars empty	TRAIN: Gross tons	Gross ton-miles, thousands	Total coal, lb.	Water evaporated, gal.	Ratio, water to coal	Coal, lb. per 1,000 ton-miles	Water, lb. per 1,000 ton-miles
Westbound: Clovis to Vaughn, 130.8 Miles; Ruling Grade 0.6 Per Cent													
1	6—36	6—02	21.7	3	51—	73	4,130	540.1	47,500	37,412	6:54	88.0	575
3	6—22	5—29	23.8	4	29—	103	4,154	544.0	45,500	37,740	6:89	83.6	576
5	7—09	6—10	21.2	4	48—	98	4,409	577.0	56,250	41,718	6:16	97.5	600
7	5—27	5—03	25.9	4	56—	55	3,765	492.5	44,300	34,663	6:50	89.9	584
9	6—27	6—03	21.6	3	56—	81	4,491	588.0	50,399	40,335	6:65	85.5	569
11	8—27	6—02	21.7	5	{77—	24	5,055}	656.0	57,300	46,384	6:72	87.3	587
					{77—	22	5,000}						
Average	6—47	5—50	22.7	4	53—	72	4,327	566.2	50,191	39,709	6:58	88.6	582
Vaughn to Belen, 109.0 Miles; Ruling Grade, 0.6 Per Cent													
1	5—00	4—30	24.2	5	49—	72	4,003	436.4	27,500	19,770	5:96	63.0	376
3	4—34	4—01	27.1	3	25—	101	3,937	428.0	25,300	17,960	5:89	59.1	348
5	6—33	5—36	19.5	5	{45—	100	4,389}	475.5	30,400	23,770	6:49	63.9	415
					{43—	100	4,319}						
7	4—57	4—27	24.5	5	56—	50	3,660	399.0	23,200	18,140	6:50	58.1	377
9	4—37	4—04	26.8	3	56—	81	4,491	489.5	25,400	20,460	6:69	51.9	347
11	6—02	4—47	22.8	7	76—	24	4,999	541.0	31,150	25,200	6:70	57.6	386
Average	5—17	4—34	24.2	5	51—	71	4,242	461.6	27,158	20,883	6:38	58.9	375
Eastbound: Belen to Vaughn, 109.0 Miles; Ruling Grade, 1.25 Per Cent													
2	6—17	5—56	18.4	3	115—	3	5,331	488.2	40,000	29,760	6:18	81.9	506
4	5—36	5—10	21.1	3	120—	1	5,720	524.0	42,200	29,000	5:70	80.6	459
6	6—30	5—32	19.7	6	110—	8	5,497	507.4	39,750	29,912	6:24	78.3	489
8	4—55	4—30	24.2	4	112—	1	5,414	496.0	39,500	28,973	6:09	79.8	486
10	5—03	4—16	25.5	6	{64—	3	3,200}	399.8	37,800	28,234	6:20	94.5	586
					{76—	4	4,157}						
12	8—50	5—35	19.5	6	129—	1	5,999	550.1	55,850	38,385	5:70	101.5	579
Average	6—12	5—10	21.4	5	110—	3	5,272	494.3	42,517	30,711	6:01	86.1	517
Vaughn to Clovis, 130.8 Miles; Ruling Grade, 0.6 Per Cent													
2	5—33	4—20	30.2	6	115—	3	5,331	697.3	23,600	18,465	6:50	33.8	220
4	5—45	4—49	27.2	6	{120—	1	5,720}	754.4	24,900	20,453	6:82	33.0	225
					{123—	1	5,825}						
6	4—15	3—56	33.3	5	110—	8	5,497	718.0	21,750	15,350	5:86	30.3	177
8	4—42	4—14	30.9	5	112—	1	5,414	708.0	19,200	15,687	6:78	27.1	184
10	5—12	4—22	30.0	5	114—	8	6,014	787.0	23,050	19,842	7:14	29.3	209
12	4—46	4—22	30.0	3	129—	1	5,999	784.0	21,550	16,575	6:38	27.5	175
Average	5—02	4—20	30.3	5	117—	4	5,670	741.4	22,341	17,729	6:59	30.2	198

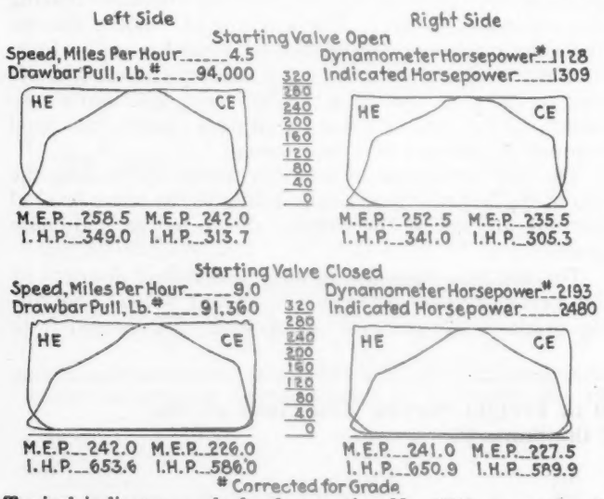
1.25 per cent from Belen to Mountainair and 0.6 per cent from Mountainair to Clovis. Helpers are used on the 1.25-per cent grade, though Locomotive 5000 was used alone on Run 10. A condensed profile of the territory is illustrated.

The locomotive was handled by pool crews which changed at Vaughn going in either direction. The road foreman of engines or the fuel supervisor accompanied all trips to assure uniform handling and full boiler pressure. The locomotive was operated with a wide open throttle where conditions permitted.

In computing and compiling data taken during the test, the division has been divided at Vaughn and data averaged for each direction on each district for more ready comparison of the locomotive's performance under different conditions.

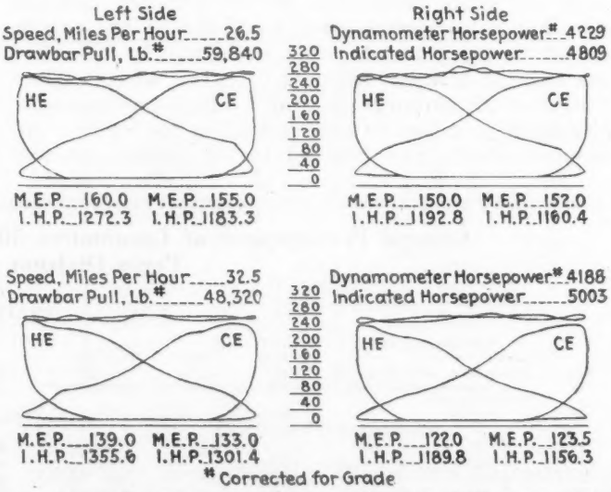
General Summary—Average of Eastbound and Westbound Runs

Total time on road, hr. min.	5—50
Total dead time, hr. min.	0—51
Total running time, hr. min.	4—59
Speed, m.p.h.	24.7
Train stops, total	5
Train:	
Loads	83
Empties	37
Total cars	120
Gross tons	4,878
Gross ton-miles, thousands	565.9
Work, million ft. lb.	18,086
Total coal as fired, lb.	35,552
Boiler and superheater	6.39
Equivalent evaporation, per lb. of coal:	
Boiler	6.77
Boiler and superheater	7.83
Boiler, superheater and feedwater heater	8.61
Work performance:	
Mileage:	
Over division	120.04
Working steam	75.09
Drawbar pull, lb.:	
Average over division	28,442
Working steam	44,701
Million ft. lb.:	
Total	18,086
Per mile:	
Over division	150.44
Working steam	236.72
Per 1,000 ton-miles	31.96
Power performance:	
Boiler horsepower:	
Boiler	1,378
Boiler and superheater	1,604
Boiler, superheater and feedwater heater	1,761
Drawbar horsepower	1,833
Water per drawbar horsepower-hour, lb.	24.3
Coal per drawbar horsepower-hour, lb.	3.83
Thermal efficiency, per cent:	
Boiler	52.2
Boiler and superheater	60.4
Boiler, superheater and feedwater heater	66.4
Locomotive at drawbar	5.07



Typical indicator cards for locomotive No. 5000 at speeds of 4.5 and 9.0 m.p.h.

Heat value per lb. coal, B.t.u.	12,585
Water from tank, gal.	24,929
Water to boiler, gal.	27,258
Water to boiler, lb.	226,224
Ratio, lb. water per lb. coal	6.39
Coal per 1,000 ton-miles, lb.	66.0
Coal per million ft. lb., lb.	2.03
Water per 1,000 ton-miles, lb.	418
Water per million ft. lb., lb.	12.89
Pressure, lb. per sq. in.:	
Boiler	298
Valve chest	281
Cylinder back pressure	12.4
Temperatures, deg. F.:	
Feedwater entering tank	75
Feedwater entering heater	101.7
Feedwater entering boiler	194
Superheated steam	655
Smokebox	498
Atmosphere	78
Exhaust steam	274
Draft, in. water:	
Header chamber	6.8
Smokebox	9.2
Combustion rates, coal, lb.:	
Total per trip	35,552
Per hr. total time	6,105
Per hr. running time	7,014
Per sq. ft. grate area	57.7
Per sq. ft. heating surface, boiler	1.14
Per sq. ft. boiler and superheater	0.81
Stack loss, lb.	4,809
Per cent of coal fired	13.7
Heat value of cinders, per lb., B.t.u.	8,535
Evaporation rates, water, lb.:	
Actual total per trip	226,224
Actual per hour running time	44,608
Equivalent evaporation from and at 212 deg. F.:	
Per hour running time:	
Boiler	47,890
Boiler and superheater	55,441
Boiler, superheater and feedwater heater	60,816
Per sq. ft. heating surface:	
Boiler	7.79



Typical indicator cards for locomotive No. 5000 at speeds of 26.5 and 32.5 m.p.h.

This locomotive had an extraordinary capacity for sustained power at high speeds, which is reflected by power performance curves. It exerted a drawbar pull of 50,000 lb. at 33 m.p.h., equivalent to 4,350 drawbar horsepower, at which it had a machine efficiency of 84 per cent. With a drawbar pull of 82,500 lb. at 15 m.p.h., the machine efficiency was 90.0 per cent.

The indicator cards show a very good steam distribution. The pair at 4.5 m.p.h. were taken with the Chapman-Lanning starting valves open at approximately 4½ m.p.h. on a 1¼-per cent grade. The pair at 9 m.p.h. were taken with starting valves closed immediately after the first pair. The indicated tractive-force curve shows the effect of having the starting valve open which admits steam through a 1¼ in.-diameter pipe during the expansion after the main valve has closed.

The tractive force of the locomotive is calculated to be 93,000 lb., which, with a weight on the drivers of 348,000 lb., gives a factor of 3.75. The locomotive has shown over 93,000 lb. at the drawbar.

Cast-Steel Foundations For Railroad Equipment

By William M. Sheehan*

Steel-casting designer has combined many separate parts of cars and locomotives into fewer and stronger units—Inherent qualities of cast steel makes possible the molding of castings of large size and any shape.

CAST steel is unique among the commercial forms of iron and steel in that it is the only one which possesses, within itself, the inherent qualities of homogeneity, unrestricted size and shape, high tensile strength, flexibility of metal distribution, resistance to corrosion and gracefulness of outline. It is the most versatile member of the ferrous group for it combines the strength-giving qualities of steel with the design flexibility and other advantages of cast iron.

One of the outstanding qualities of cast iron is its ability to resist corrosion. This was recently demonstrated at Richmond, Va., where a line of cast-iron water pipe, which had been in use for over 100 years, was found to be in excellent condition and good for many more years of usefulness.

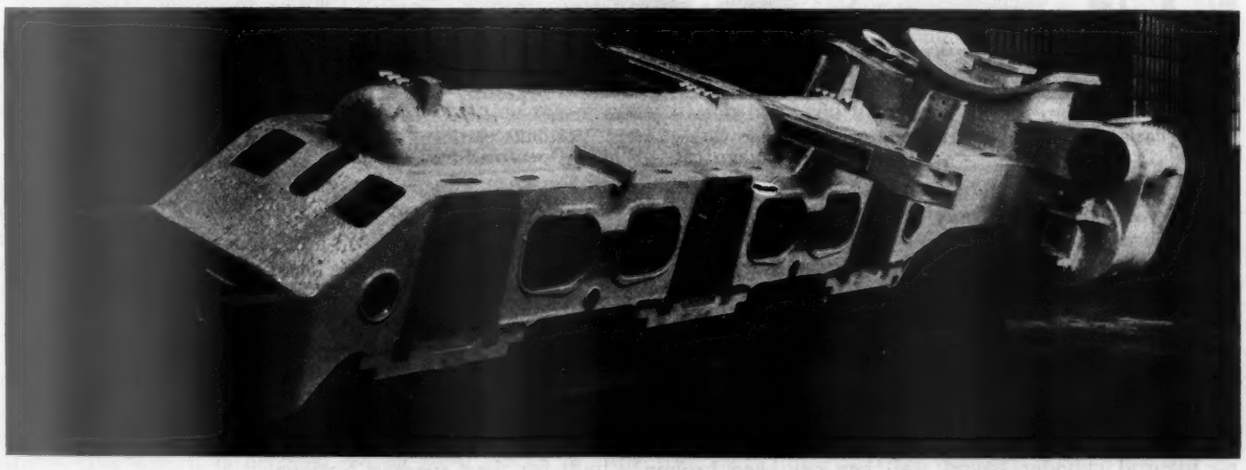
Cast steel long ago demonstrated its ability to withstand a most gruelling corrosive condition in railroad service. After 20 years of continuous use on the Central Railroad of New Jersey, the first two cast-steel locomotive tenderframes, made by the Commonwealth Steel Company in the latter part of 1907, were removed from service to form a part of an exhibit at the Commonwealth plant. A careful examination disclosed that no deterioration had taken place in that time. This, despite the fact that they had been operating along the Atlantic seaboard, adjacent to salt water, and subject at all times to the action of sulphuric acid brought about by the coal and water carried in the tender. In fact, the siliceous coating of molding sand, fused into the surface of the steel and forming its protective skin, was still intact. Another interesting item is that one of these frames had been arranged for the application of rolled-steel side and end sills, and these parts, it was learned, had been replaced a number of times during the 20 years of service.

Water-Bottom Tenders

The maintenance on bottoms of tender tanks has long been recognized as an expensive item. The wooden planks resting on the tender frames become saturated with water and retain it and help to bring about a rapid deterioration of the bottom tank sheet. Then, too, the larger capacity tender tanks required for greater coal and water storage, weaved and buckled, causing leakage and cracking of the tank sheets. It was reasoned that as the cast-steel frame had proven that it would resist corrosion, it was logical to utilize its strength and rigidity as a tank bottom and obtain additional water storage in the space previously taken by the frame and the wooden floor. This was done; the bottom of the frame was cast solid and the tank sides and ends were attached directly to pads on the frame. As a result, about 2,000 additional gallons of water are secured and the coal bunker can also be enlarged. At the same time, tank-bottom maintenance is permanently eliminated and the center of gravity is lowered several inches.

Another innovation in water-bottom tender design utilizing cast steel is the integral-stoker conveyor housing. The practice, since stokers came into use, has been to block off a compartment in the tank in which the conveyor housing was mounted. A considerable por-

* The author is manager of eastern district sales, General Steel Castings Corporation, Eddystone, Pa. This article is an abstract of a paper presented at the November 19, 1931, meeting of the Southern and Southwestern Railway Club at Atlanta, Ga.



Locomotive bed casting with the cylinders and main reservoir cast integral

tion of the tank was thus rendered useless for water storage. The floor of this compartment has to be sealed on water bottom tenders in order to retain the water in the frame beneath it. A number of tenders have recently been built in which the housing, which was of the non-oscillating type, was made of cast steel with end tank walls and side-sheet attaching flanges formed integral. The bottom of the trough formed the roof of a water compartment under the stoker conveyor, and about 500 additional gallons capacity thereby obtained with an actual weight saving on the light tender. At the same time, the stoker mechanism foundation is secured most substantially to the tender frame, thus insuring increased life to the stoker machinery parts. The tank bottom under the conveyor housing is also made easily accessible for cleaning.

Six-Wheel Equalized Trucks

The large locomotive tender involved the use of six-wheel equalized trucks with minimum wheel base and clasp brakes. An analysis of the operating conditions showed the necessity of lateral compensation, so swing motion was provided. The magnitude of these lateral forces is so great that unless they are reduced or neutralized by lateral compensation, the track, wheels, truck and tender must absorb them with inevitable breakage of parts or derailments following.

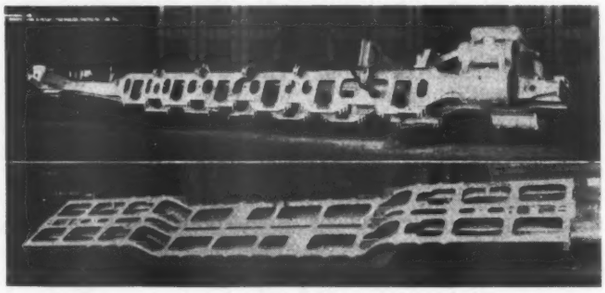
Many improvements have been added to these trucks as a result of suggestions made by those engaged in maintenance. The pedestals are now formed integral, their wearing faces are provided with hardened steel liners, and case hardened pins are used with case hardened bushings applied in all pin holes.

One-Piece Cast-Steel Locomotive Bed

A comparison of the maintenance costs between locomotives equipped with cast-steel beds and others of the same class not so equipped, indicates a maintenance saving at each general shopping of $3,000.00 per engine.

When it was first proposed to cast the cylinders integral with the bed, many railroad men asked what could be done should a corner of a cylinder be broken due to sideswipe. The answer given was that a piece to fit could be cast, welded in place and the cylinder rebored. The preponderance of opinion among railroad officers favored the integral cylinders, it being agreed that breakages due to sideswipe or hydraulic failure could be repaired in this manner. However, after six years of experience, it is interesting to note that although a number of bed-equipped engines have been in accidents, no integral cylinder barrel wall has yet been broken.

A number of beds have been made with the air reservoirs integral and forming the central backbone. It is generally agreed that an improved appearance is secured by removing the reservoirs from beneath the running boards, but, in addition, their removal eliminates the possibility of their being punctured when a rod or piece of motion work breaks. The corrosive resistant surface of the cast-steel reservoir also insures a protection against deterioration due to condensate and viscous masses reposing on the bottom of the inside of the reservoir. The utilization of the integral reservoir as the backbone of bed permits a thicker wall which increases the safety feature. An officer of one of the railroads using this construction advises that a considerable saving is obtained at shopping as less work is involved.



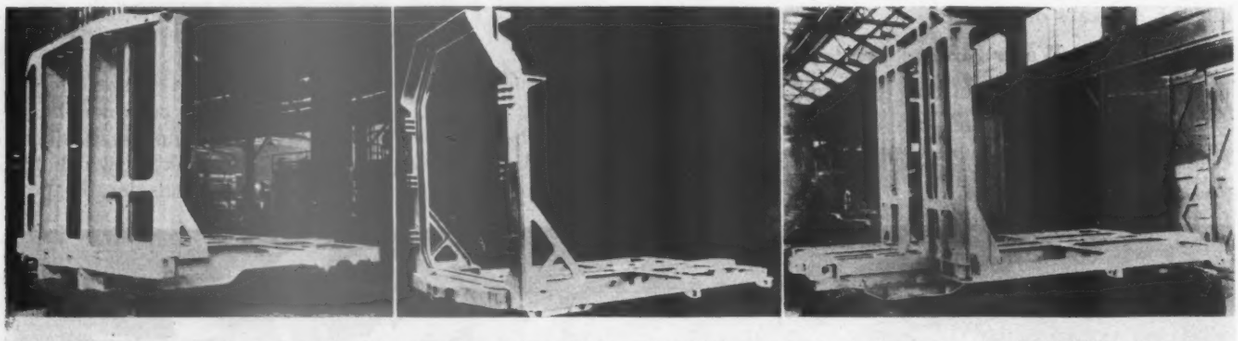
Top: A large locomotive bed casting—Bottom: Foundation for well-car for transporting transformers and heavy machinery

There have been a number of beds recently made with the rear cylinder heads and guide brackets formed integral and this construction will eliminate the difficulties now experienced at this point.

There are now over 1,100 steam locomotives equipped with beds in use in all kinds of operating service and on every type of modern power, from the six-wheel switcher to the heavy Mallet. Thirty-six roads are now using them.

The first locomotive beds were applied by the New Haven in 1918 to passenger electric locomotives operating between New York and New Haven, Conn. Each of these locomotives has two beds. Ten locomotives recently built by this road have not only beds but also one-piece cast-steel cab underframes and guiding trucks. All of the Pennsylvania locomotives to operate in the newly electrified zone between New York and Washington, D. C., are being equipped with one-piece beds. The most complicated casting so far made for railroad equipment is the bed for the Diesel electric locomotive built for the Canadian National.

The cast unit with its greater uniformity of section



Three designs of end construction for passenger cars—Left: Vestibule-platform design—Center: Casting for blind-end express and baggage cars—Right: Open-platform design

permits the metal thicknesses to be just the amount required and these can be gradually tapered as the stresses change; corners can be rounded and abrupt changes in shape obviated. This allows economy of material and removes the tendency to localized stresses as often exist where two or more layers of metal are used in the built-up construction. Then, too, a gracefulness is permitted in the shape of the cast unit not possible in a job fabricated by bolting, riveting or welding. Beauty of outline is an object to be always sought where strength requirements are not affected. One is immediately impressed with the rugged, yet more graceful appearance of the one-piece locomotive bed when it is compared with the built-up, bolted construction displaced.

When a locomotive strikes a motor vehicle at a grade crossing, it not only, in most cases, wrecks the car and injures or kills the occupants, but oftentimes, the projecting coupler impinges the side of the automobile above the running board and carries it along the track, frequently forcing a portion of it under the engine-truck wheels, thus causing a derailment. The cast-steel pilot and drop coupler have been developed in order to throw a motor vehicle from the right-of-way when the locomotive strikes it. Except when the coupler is in use, it is dropped into a recess in the pilot which then

Integral stoker conveyor housing

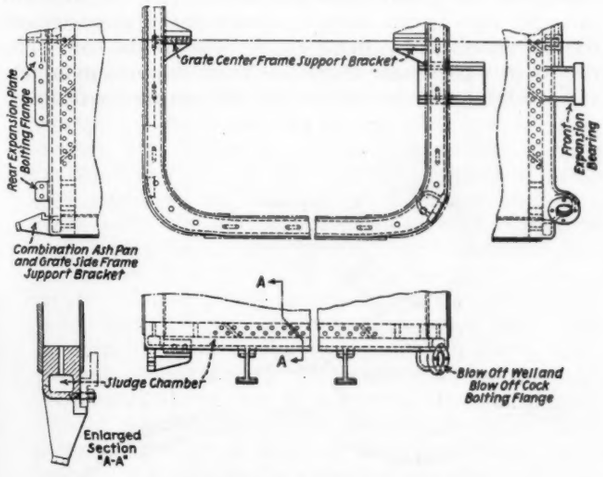
presents substantially concial deflecting surfaces. This coupler has a counter-balanced portion at the rear which, when in dropped position, seats against a cross-beam on the footplate and serves as a backbone for the pilot. The counterbalancing feature permits the couples to be easily raised or lowered by means of the uncoupling lever. The pin which passes through brackets on the pilot and body of the coupler, when in coupling position, also serves as a retainer for keeping the coupler in dropped position when inoperative.

Steel Castings in Boiler Construction

The development of higher-pressure boilers offers many opportunities to the steel casting designer for boiler improvements. The flexibility of form which castings give will, it is believed, be of great utility in future boiler design. Steel castings are being used today with success as turbine casings and other high pressure steam containers and the experience thus obtained proves conclusively their feasibility. The use of cast steel in boilers is especially desirable as with its corrosive resisting qualities, it will give longer life to the part for which it is adapted.

The New Haven has a number of locomotives equipped with cast-steel smoke boxes. These permit a flat base for the cylinder attachment, incorporate the smoke-box front and the brackets for the diaphragm and netting, as well as the other appurtenances. The depressions in the smoke box for the feed-water heater or steam pipe can be formed integrally with ease.

One-piece cast-steel solid mud rings, have for some



One-piece cast-steel solid mud ring

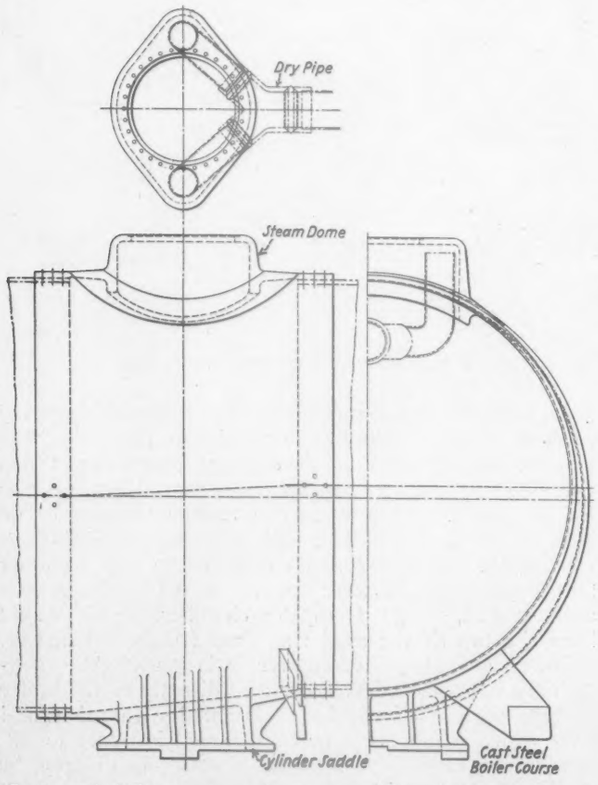
time, been the usual construction but it is now proposed to cast a hollow chamber in the lower portion of the ring below the fire-box sheet rivets and connect this chamber to the water legs by holes spaced between the fire-box rivets and thus form a sludge receiver. The blow-off cocks would be attached to the bottom of the ring at the front end and connected to this chamber and when the cocks were opened, would discharge any accumulated sludge from the chamber. This would keep the top of the mud ring free from solid matter.

On an articulated locomotive, it is inadvisable to attach the cylinders of the rear unit directly to the boiler as that portion of the boiler is filled with tubes and flues which would have to be removed in order to detach the cylinders. The usual practice is to apply a shallow saddle to the underside of the boiler and attach the cylinders to the bottom of this saddle. Usually, the dome is applied at the top of this course. A construction has been developed which incorporates, in one cast-steel piece, the dome, the boiler course and cylinder-attaching bracket. In this way, the present difficulties attendant in rear cylinder attachments for articulated locomotives are removed, and at the same time, the longitudinal seam and the reinforcing liners between the boiler course and separate dome and saddle are eliminated. The circumferential joints for connecting adjacent courses are machined to insure a good fit. There have been instances where the dome would have been better if made in a form other than cylindrical. In the cast structure, the dome can be any shape that may be desired.

Cast-steel equalized swing-motion trucks embodied the first large integral steel castings utilized on railroads. The first of these were applied in 1905

and since then, many improvements have been made in passenger-truck design to secure better riding and to permit easier inspection and maintenance. Both four- and six-wheel trucks are now made with straight equalizers which put the brake shoes in the clear, making possible easier and quicker inspection and renewal of shoes. Pedestals are also now cast as a part of the truck frame and their wearing surfaces protected by renewable hard-steel liners. On six-wheel trucks, the side bearings are cast integral with the truck center bolster, permitting an inside side bearing and eliminating the outside bearing arch.

One of the worst forms of accidents which can happen to a passenger train is a telescoping collision in which one car climbs over the platform of the adjacent car and, due to the impact, shears the end posts and roof members and penetrates the body of the car. The results in a passenger coach are horrible to contemplate and while, thanks to efforts for efficient and safe operation, these accidents are not common, still, unfortunately, they sometimes occur.



Cast-steel boiler course for an articulated locomotive in which are incorporated the dome and cylinder-attaching bracket

The desire to prevent such catastrophes led to the development of the cast-steel passenger-car end construction. In this, the end frame of the car is a rugged unit with a substantial connection to the platform and with upright door and corner posts joining the top and bottom sills. This top sill is attached to the roof and side members. The upright posts will withstand a blow of one and one half million pounds struck 18 in. above the floor without fracturing and the tensile value of the top sill prevents the roof being rent asunder. Many roads have adopted this construction for both vestibule and blind-end cars, convinced that such effective insurance against a telescopic collision is most desirable. A modification of this end construction has also been developed for wide door express cars.

Cast Structure Has Distinct Function

It is believed that the cast structure has a distinct place in industry that will not be taken by any fabricated alternate. The trend of machine design for some time has been toward units and actual molecular unity in complex shapes is not assured in any forms other than castings or forgings.

The casting process permits metal to be placed exactly where it is needed for strength and in just the required amount. Laps, seams, and joints, which are necessary in all fabricated forms, are eliminated. A bolted or riveted structure forces the designer to compromise with proper sections and metal distribution to provide clearance for the application of bolts or rivets and also to make allowance for material removed for the bolt or rivet holes. Every user of machinery knows that a considerable proportion of the failures he encounters is through these holes and is often caused by the looseness of individual bolts or rivets.

Freight-Car Foundations of Cast Steel

The demonstrated ability of the cast-steel tender frame to withstand corrosive action naturally caused a similar cast structure to be considered where corrosive deterioration was being experienced in other railroad equipment. Gondola cars with built-in underframes, used for the transportation of bulk sulphur in the southwest were subject to especially high upkeep charges due to the acid formation and their underframes required frequent renewals. The Santa Fe, which handles a considerable portion of this traffic, has several hundred cars with cast steel underframes now in use.

It was a logical sequence of these developments that a one-piece underframe of cast steel should be made for coal-carrying cars. One of the large coal-carrying roads has recently placed in service some 50-ton gondola cars with this type of foundation. These have a single center sill connecting the bolsters. The casting process permitted this single member of required area to be used with integral crossties at intervals connecting it to the side sills.

A more ambitious project, but one which promises still greater savings, is the cast-steel hopper-car underframe with integral hoppers and door frames. Hopper-car foundations are badly punished in two ways. Not only do the draft sills and bolsters have to withstand the heavy end loads resulting from run-ins and bumping in classification yards, but the entire frame structure between the end-slope sheets is subject to severe corrosive action. The numerous joints, bends and seams in the hopper zone provide pockets and caches where the concentrated sulphuric acid, resulting from the moisture and coal, can lodge and rapidly eat away the rolled-steel plates. An examination of hopper cars on any repair track bears out this statement. The cast foundation, with its seamless hopper walls and acid resistant surface, should function indefinitely.

The bulk movement of petroleum products, to secure lowest operating cost, requires a greater capacity car of nominal length and a low center of gravity. The distance from the rail to the top of the cylindrical tank is limited. The usual type of underframe, with the longitudinal sills below the tank, restricts the tank diameter. The cast-steel tank car bottom, forming the lower segment of the tank and containing within itself the buffing and pulling column, substantially increases the

available tank diameter without increasing the distance from the rail to the top. This permits a much greater volume in the given length and a lower center of gravity. Here, again, the protective surface of the casting is especially advantageous for the transportation of acids and high sulphur content oils. The Santa Fe has a considerable number of cars built in this manner.

The railroads engaged in handling iron ore from the mines in northern Minnesota and Wisconsin to Lake Superior ports have a peculiar problem in car construction to meet. On account of the spacing of the hatches in the ore boats being 12 ft., the pockets in the docks must have the same spacing, and the economic length over coupler pulling faces of the ore cars has been established as 24 ft. These cars have a single-center hopper, the entire load of 75 tons being self-clearing in less than one minute. No center sills are permitted, so the vertical and longitudinal forces must be carried through the side sills, and transversely, to the center plates and draft sills. The cast steel underframe has been successfully embodied in several hundred of these cars.

Caboose and Special-Service Cars

Roads traversing regions where pusher locomotives are needed, have a problem to secure a caboose car, which, when placed between the rear of the train and the pusher, will be safe and free from vibration. It is the practice on many roads to place the caboose behind the pusher. This requires two switching movements which could be eliminated if a more substantial caboose car underframe were used. The cast steel underframe on the Reading's caboose cars solves this problem satisfactorily.

The task of handling large transformers and other electrical equipment, as well as machinery and other large units, without dismantling, requires a drop center car with a minimum distance from the rail to loading platform. Cars of this type with a built-up underframe have shown high maintenance costs, particularly in the curved offset portion, and in order to obviate this, the cast foundation was developed. One of the large western roads, a few years ago, had need for some flat cars of 200-tons capacity, and selected the one-piece cast-steel frame. These cars were built with eight-wheel trucks.

Air-dump cars used extensively in maintenance-of-way or construction work and wherever self-clearing side unloading is required, present an underframe problem of great difficulty. These cars usually have two large air dump cylinders on each side attached to the center sill. When the load is expelled by these cylinders lifting one side of car, there is a severe twist set up in the center sills between the bolsters and cylinders. These torsional forces have been most effectively met in the integral cast underframe, as this structure presents a box section with strength members at the points of maximum stress.

The general use of humps in classification yards and the larger and heavier freight cars with their greater loadings, make it imperative that underframes be stronger. The limitations of the fabricated or built-up frames are becoming increasingly evident. Freight car truck side frames and bolsters are made of integral-steel castings, and the center plates are cast in one piece with the bolsters. The heavy end shocks, tending as they do, to move the car body longitudinally on the trucks, in a short time loosen the body center plate rivets. These rivets, which have the added duty of tying together the bolster bottom cover plate, bolster diaphragms, center sills and center sill fillers, are important elements at a vital point on the car. Their frequent failures due to looseness hastens disintegration of that portion of the underframe. On the one-piece freight-car foundation, the center plates are cast integral with the underframe and are effectively braced by the internal structure of the bolster.

One of the large eastern railroads serving the automobile industry, to meet the problem of motor-traffic competition and to give better service to automobile manufacturers, has developed a car of increased cubical capacity. This allows the maximum number of auto-

(Continued on page 584)

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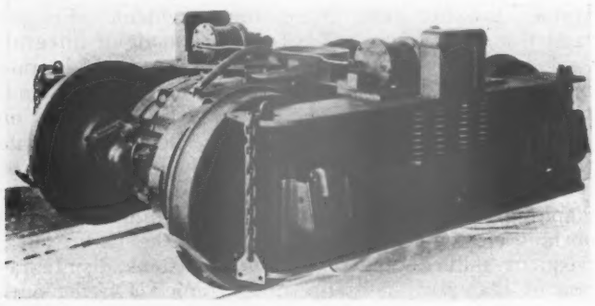
Belt Railway of Chicago locomotive with white stripes painted on the foot boards as a safety measure

Oil-Electric Switchers For the Bush Terminal

Powered with 325-hp. Ingersoll-Rand oil engines—Locomotives exert 22,600 lb. tractive force at one-hour rating — Electric-arc welding was used in the construction of the cab, underframe and trucks

SEVEN 60-ton, 300-hp. oil-electric locomotives were recently placed in switching service by the Bush Terminal, New York. These switch engines, which were built by the General Electric Company at its Erie, Pa., plant, are powered with Ingersoll-Rand 10-in. by 12-in. six-cylinder oil engines, developing 325 b.hp. at 550 r.p.m. The engine is directly connected to a G. E. DT-515 differential-compound generator. The tractive force at 3.5 m.p.h. is 22,600 lb. at one-hour rating. Other important dimensions and weights are shown in the table.

While adhering to well-established practice so far as the engine and the electric equipment are concerned, new features have been embodied in the design and construction of the cab, underframe and trucks, which are fabricated entirely from structural-steel shapes and plates, and arc welded throughout. There are no rivets, and bolts have been used only for those parts requiring occasional removal or renewal.



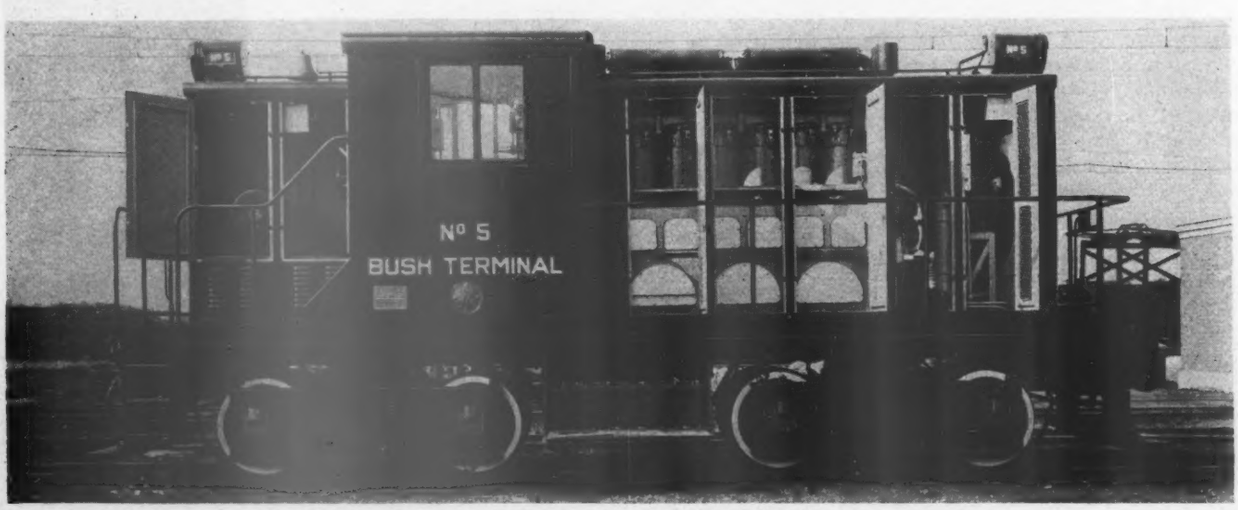
All-welded truck with the motors installed

Frame and Cab Construction

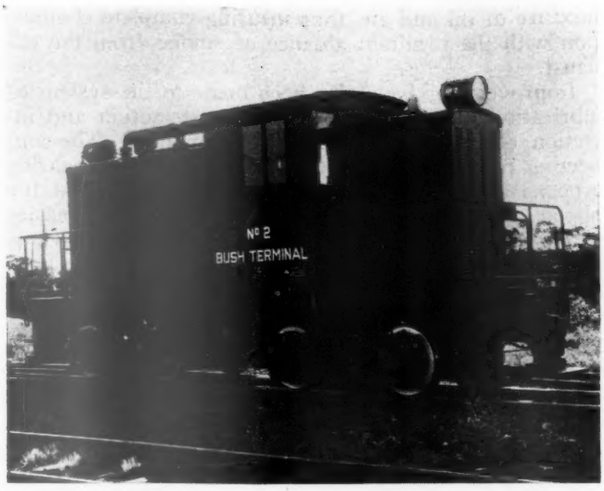
The truck frame consists essentially of three members; two side frames of 26-in., 151-lb. girder beams, with a 22-in., 108-lb. girder beam serving as the bolster. The bolster beam is welded directly to the side members, the joint surfaces being reinforced with heavy gusset plates and brace plates. All welds are continuous and, except at a few minor points, all welds on the truck have been made with type R heavily coated electrode. The load is carried to the journal boxes through double equalizer bars located on either side of the girder-beam web. It is transmitted to each bar through four helical springs.

The platform or underframe has two 14-in., 100-lb. H-columns for center sills with intermediate and side sills of 6-in. channel. The engine is mounted directly on these center sills so that, in addition to taking the buffeting stresses, they afford also a rigid support for the power plant. For end sills 1½-in. plates are used. A ⅜-in. deck plate extends over the entire platform and is attached to the longitudinal sills by ⅜-in. intermittent welds on a 10-in. pitch. End plates are attached by ¾-in. continuous welds. The body bolsters are attached to all four sills by ¼-in. continuous welds.

The cab structure consists of a framing made of 2-in. T-sections with continuous welds at all joints. The side and roof sheets are attached to this structure by intermittent welds on a 6-in. pitch, except at the outer surface of the side sheets where, to provide water-tight joints, continuous welds are employed. As will be noted from the illustrations, the side sheets are placed inside the framing. This permits tying the edge of the sheet at two places, the intermittent weld on the in-



Bush Terminal locomotive No. 5 with the side doors of the cab open to show the location of the engine and control equipment



Bush Terminal locomotive No. 2 as it appears in service

side and the continuous weld on the outside. In addition, the backs of the T-section, projecting through in this manner, produce a panel effect in the cab wall and break up what would otherwise be a monotonously plain surface.

Cab and Control Arrangement

Instead of the usual box cab which has heretofore characterized most oil-electric locomotives a modified steeple, or hood type, cab has been adopted. The engine and a small portion of the generator are enclosed by the long hood, with the remainder of the generator projecting into the main cab. The control equipment, the air compressor and the fuel tank are located under the short hood at the opposite end. A tubular type

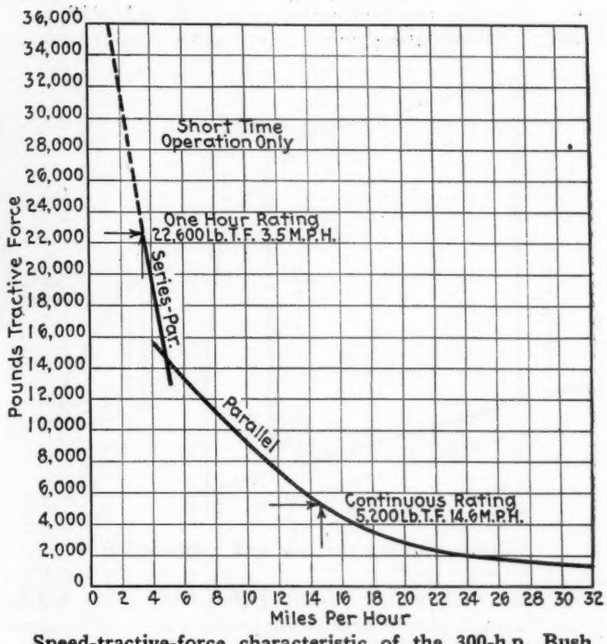
Dimensions and Weights of the Bush Terminal Oil-Electric Switchers

Railroad	Bush Terminal
Builder	General Electric Co.
Type of locomotive	B-B (Electric classification)
Service	Switching
Oil engine:	
Builder	Ingersoll-Rand
Cylinders, diam. and stroke	10 in. by 12 in.
Cylinders, number	Six
Brake horsepower	325
Generator, type	G. E. DT-515
Traction motors, type	(4) G. E. HM-838
Weight, light	117,500 lb.
Weight, in running order	120,000 lb.
Wheel bases:	
Rigid	6 ft. 6 in.
Total	27 ft. 6 in.
Length, inside knuckles	34 ft. 6 in.
Height, overall	13 ft. 8½ in.
Width, overall	9 ft. 6 in.
General data:	
Horsepower rating	300
Tractive force, one-hour rating	22,600 lb.

radiator consisting of 14 sections is built integral with the front end of the engine hood. Air is drawn through this radiator and discharged through the screen doors at the sides by a 42-in., propeller-type fan directly driven by a 900-r.p.m. series motor. The sides of both hoods consist entirely of hinged doors and on top of the engine hood there is a hinged hatch cover which may be thrown back or locked partially open for ventilation.

In the main or operating cab there are two control stations located in diagonally opposite corners. To provide better visibility, the floor is raised above the main deck, which brings it about to the center line of the generator around which it is fitted. About 70 per cent of this floor area consists of a hinged trap door which, when raised, gives access to the lower half of the generator.

This hood type cab and the location of the apparatus therein have been designed with a view of affording

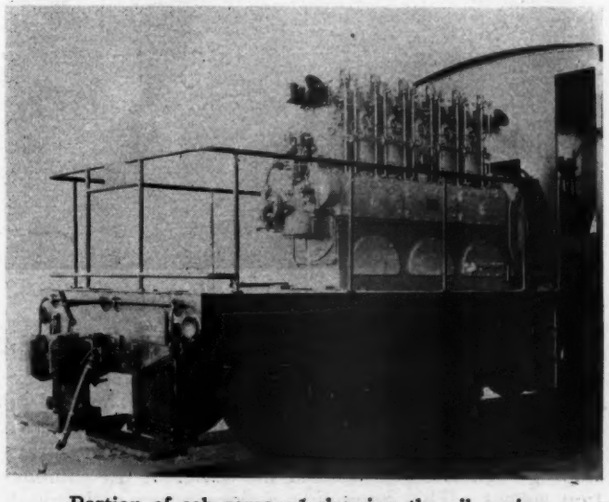


Speed-tractive-force characteristic of the 300-h.p. Bush Terminal switchers

maximum accessibility to all parts of the equipment. All routine inspection and maintenance operations may be carried on through the doors of the hoods, and also most overhauling jobs like the renewal of crank-shaft bearings, etc. Through the hatch in the top, the cam shaft and valve mechanism may be adjusted and cylinder heads, pistons, etc., may be removed. The engine hood is bolted on so it may be removed entirely, thus completely exposing the engine. The whole power plant may then be lifted off or, if no crane is available, it may be rolled off endwise onto a flat car.

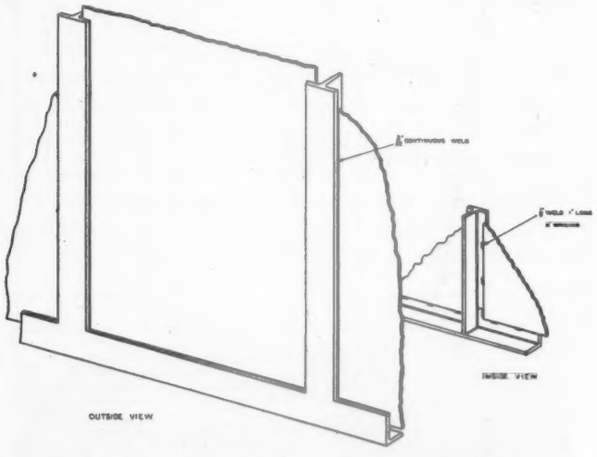
Engine and Power Transmission

The Ingersoll-Rand engine is directly connected to a DT-515 differential compound-wound, commutating-



Portion of cab removed showing the oil engine

pole, direct-current generator, on the shaft extension of which is a 125-volt auxiliary generator for exciting the main field windings, supplying power for the auxiliary equipment and charging the storage battery. This battery consists of 56 cells of 100 amp. hr. capacity and serves for engine starting, lights and for control operation. The four traction motors are G. E. HM-838, box-frame, commutating-pole type with roller-bearing



Detail showing the cab wall construction

armatures. They are mounted directly on the axles, drive through single reduction gearing and have nose support on the truck bolster.

Several new features have been incorporated in the design of the oil engine with which the seven new Bush Terminal switchers are equipped. An important feature is an improved design of cylinder head to effect smokeless combustion. Both the intake and exhaust manifolds are incorporated in the cylinder head, which

Ingersoll-Rand 10-in. by 12 in. oil engine

is arranged so that air is admitted to the cylinder directly from the intake manifold and the gases are exhausted directly to the exhaust manifold. The fuel oil is injected into the combustion chamber through two spray nozzles which are arranged so that the sprays impinge against each other at the center of the combustion spaces. This impinging action causes a thorough mixture of oil and air, thus insuring complete combustion with the resultant absence of smoke from the exhaust.

Improvements have also been made to the system of lubrication, the system of fuel-oil distribution and injection, electrical engine control and mufflers. The connecting rod used is a solid steel forging of the marine type having a solid end with a round bearing at the piston connection. This design is simpler and easier to maintain than the connecting rods used in previous installations where the piston end of the rod had a box-type bearing secured with four studs. The main-bearing assembly is held in place by means of a wedge and pedestal arrangement very similar to that used on steam locomotives and with the maintenance of which railroad-shop mechanics are familiar.

Control Equipment

The control equipment is G. E. Type M, consisting of electro-magnetically operated contactors for changing motor combinations and electro-pneumatically operated reverser for changing direction. Two motor combinations are provided: The first with all four in series and the second grouped series-parallel. The speed of the locomotive is controlled entirely by movement of the engine throttle handles at the control stations. Aside from the two air-brake valves and the small controller handle for reversing, the engineman has only this throttle handle to operate, the transfer of motor connections from series to series-parallel being effected automatically.

This automatic change-over functions with the voltage of the generator and is arranged so that it occurs at such a point that full capacity of the engine is available for either motor combination. At each control station there is an illuminated panel on which are mounted air gages, engine-temperature and oil-pressure gages and a traction-motor ammeter. Along with this, a group of push-button switches provides the engineman with control of the headlights and the radiator-fan motor.

The air brake equipment is Westinghouse Schedule 14-EL straight and automatic with air supplied by a CP-130, 50-ft., motor-driven compressor. Four brake cylinders are used—two on each truck, which are mounted on top of the truck frame and connected directly to the foundation brake levers. The air-sanding equipment is supplied with sand from boxes located at the ends of the platform. These are filled through large sand doors fitted into the deck plate.

* * *

Old and new power on the Texas & Pacific at Fort Worth, Tex.

Examples of Recent Locomotives of the 4-8-4 Type

General Dimensions, Weights and Proportions

Railroad	A.T. &S.F.	A.T. &S.F.	A.T. &S.F.	D.L.&W.	D.L.&W.	N.P.	C.N. U-2a	C.N. U-2b	C.N. U-2c	G.T.W. U-3a	C.P. K-1a	C.R.I. &P. R-67-B	D.&R. G.W. M-64	G.N. S-1	G.N. S-2	C.& N.W. H	C.M St.P.&P. S-1
Road class	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Road number	3,751	3,755	3,751	1,501	1,603	2,607	6,100	6,131	6,151	6,300	3,100	5,000	1,702	2,552	2,577	3,006	9,700
Builder	Bald.	Bald.	Bald.	Amer.	Amer.	Amer.	Can.	Mont.	Mont.	Amer.	R.R.	Amer.	Bald.	Bald.	Bald.	Bald.	Bald.
Date built	1927	1928	1929	1927	1929	1927	1927	1927	1929	1927	1928	1929	1929	1929	1930	1929	1930
Tractive force, engine, lb.	66,000	66,000	66,000	64,500	71,600	57,500	56,800	56,800	56,800	60,200	60,800	66,700	63,700	67,000	58,300	65,200	60,000
Tractive force, booster or aux. loco., lb.	.....	.....	.....	.....	.....	11,400	.....	.....	.....	.....	.....	13,100	.....	.....	.....	11,300	.....
Cylinder horsepower (Cole)	3,406	3,406	3,406	3,280	3,317	2,965	2,928	2,928	2,928	3,120	3,221	3,042	3,148	3,530	.....	3,280	.....
Piston speed at 10 m.p.h., ft.	230.2	230.2	230.2	232.8	256.1	230.2	230.2	230.2	230.2	230.2	224.1	259.7	240.1	230.2	.....	235.8	.....
Engine and Tender Data																	
Weight of engine, lb.	421,900	428,210	432,240	421,000	418,000	426,000	379,000	381,900	383,000	399,000	423,000	434,000	408,500	472,120	420,900	498,000	450,840
Weight on drivers, lb.	269,400	272,100	272,880	262,000	262,000	260,000	230,000	233,400	232,200	234,500	250,000	265,500	252,000	273,700	247,300	288,000	258,815
Weight on front truck, lb.	64,600	63,520	65,410	62,500	65,500	62,000	65,000	63,200	66,500	66,000	61,000	68,000	64,000	88,820	78,000	87,000	79,330
Weight on trailing truck, lb.	87,900	92,590	93,950	89,500	90,500	104,000	84,000	85,300	84,300	98,500	112,000	100,500	92,500	109,600	95,600	123,000	112,695
Weight of tender, loaded, lb.	287,400	288,090	292,260	216,000	289,000	313,000	271,500	270,500	274,600	267,500	286,000	299,200	269,500	375,780	316,900	320,000	289,160
Tender, water capacity, U. S. gal.	15,000	15,000	15,000	12,000	15,000	15,000	13,800	13,800	13,200	13,550	14,400	15,000	14,000	22,000	17,000	18,000	15,000
Tender, fuel capacity, tons or gal.	20	20	20	14	22	24	20	20	20	20	18½	20	20	5,800	5,800	20	20
Wheel base, driving, ft. and in.	19—0	19—0	19—0	20—0	19—0	20—3	19—6	19—6	19—6	19—6	19—9	19—3	18—9	19—0	20—9	20—6	19—9
Wheel base, engine, ft and in.	44—0	44—0	44—0	46—8	45—6	47—2	43—10	43—10	43—10	43—10	45—9½	45—7	44—5	45—6	47—9	48—7	46—3
Wheel base, engine and tender, ft. and in.	87—2⅛	87—2⅛	87—2⅛	82—2½	84—7½	90—0	82—4¾	82—4¾	82—2¼	82—4¾	87—0¾	88—0	89—9	94—10¼	91—2	91—1	88—4½
Cylinders, diameter and stroke, in.	30x30	30x30	30x30	27x32	28x32	28x30	25½x30	25½x30	25½x30	26¼x30	25½x30	26x32	27x30	28x30	29x29	27x32	28x30
Driving wheels, diameter, in.	73	73	73	77	70	73	73	73	73	73	75	69	70	73	80	76	74
Boiler Data																	
Steam pressure, lb.	210	210	210	250	235	210	250	250	250	250	275	250	240	250	225	250	230
Fuel	Coal	Coal	Coal	Soft coal	Soft coal	Sub.B.coal	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Oil	Oil	Soft coal	Semi-Lig.
Boiler, diameter, first ring, in.	88	88	88	84¼	84¼	82 7/16	82 7/16	80⅞	80⅞	83	96½	84¼	84	88	84	90 3/16	88
Firebox, length, in.	144	144	144	132	132	162	126⅛	126⅛	126⅛	126⅛	140 7/16	132⅛	132⅛	144	138	150⅛	137
Firebox, width, in.	108	108	108	96¼	96¼	102¼	96¼	96¼	96¼	96¼	96	96¼	96¼	102	102	96¼	108¼
Tubes, number and diameter, in.	59—2¼	57—2¼	57—2¼	285—2	278—2	33—3½	27—2¼	27—2¼	42—2¼	201—2¼	59—2¼	77—2¼	43—2¼	61—2¼	38—2¼	51—2	56—2¼
Flues, number and diameter, in.	221—3½	231—3½	231—3½	50—5⅜	50—5⅜	182—3½	177—3½	177—3½	167—3½	50—5½	203—3½	202—3½	195—3½	210—3½	195—3½	214—3½	218—3½
Length over tube sheets, ft. and in.	21—0	21—0	21—0	21—6	21—6	21—0	21—6	21—6	21—6	22—0	20—6	21—6	22—0	22—0	22—0	21—0	21—0
Grate area, sq. ft.	108	108	108	88.2	88.2	115	84.4	84.4	84.4	84.3	93.5	88.3	88	102	97.7	100	103
Heating surface, firebox, total sq. ft.	452	516	540	493	515	485	432	432	415	436	422	515	446	401	379	558	540
Heating surface, tubes and flues, sq. ft.	4,981	5,130	5,132	4,700	4,621	4,115	3,812	3,812	3,805	4,171	4,509	4,928	4,471	5,004	4,402	4,656	4,860
Heating surface, total evap., sq. ft.	5,433	5,646	5,672	5,193	5,136	4,600	4,244	4,244	4,220	4,607	4,931	5,443	4,917	5,405	4,781	5,214	5,400
Superheating surface, sq. ft.	2,250	2,420	2,426	1,324	1,324	1,992	1,840	1,840	1,931	1,388	2,112	2,243	2,229	2,444	2,265	2,357	2,403
Comb. evap. and super, surface, sq. ft.	7,683	8,066	8,098	6,517	6,460	6,592	6,084	6,084	6,151	5,995	7,043	7,686	7,146	7,849	7,046	7,571	7,803
Proportions and Ratios																	
Weight on drivers ÷ weight of engine, per cent	63.8	63.5	63.1	64.0	63.0	61.1	60.7	61.1	60.7	58.8	59.0	61.2	61.6	57.9	58.8	57.8	57.4
Weight on drivers ÷ tractive force	4.08	4.12	4.13	4.17	3.66	4.52	4.05	4.10	4.08	3.89	4.12	3.98	3.96	4.08	4.04	4.42	4.31
Weight of engine ÷ comb. h. s.	54.9	53.2	53.3	64.6	64.8	64.7	62.3	62.7	62.2	66.5	59.8	56.5	57.2	60.2	59.7	66.8	57.8
Firebox surface per cent evap. h. s.	8.32	9.15	9.52	9.51	10.03	10.54	10.18	10.18	9.85	9.47	8.56	9.47	8.87	7.42	7.92	10.71	10.0
Firebox surface ÷ grate area	4.18	4.78	5.00	5.59	5.84	4.22	5.12	5.12	4.92	5.16	4.50	5.83	4.96	3.94	3.88	5.58	5.24
Superheat. surface per cent comb. h. s.	29.3	30.0	30.0	20.3	20.5	30.2	30.2	30.2	31.4	23.2	30.0	29.2	31.2	31.1	32.2	31.1	30.8
Tractive force ÷ comb. h. s.	8.59	8 19	8.15	9.92	11.08	8.73	9.33	9.33	9.24	10.05	8.65	8.67	8.92	8.53	8.28	8.62	7.69
Tractive force × dia. drivers ÷ comb. h. s.	627	598	595	763	776	638	681	681	674	733	648	598	625	623	662	655	569
Comb. heat. surface ÷ grate area	71.1	74.7	74.9	73.9	73.2	57.3	72.2	72.2	72.8	71.2	75.3	85.9	81.2	76.9	72.1	75.7	75.8
Notes	b-c-e-k	b-c-d-e-k	b-c-d-e-k	a-d	a-d	a-f-g-k	b-d-e-k	a-d-e-k	a-d-e-k	a-d	b-e-k	a-d-g-k	b-c-d-e-k	b-c-h-k	b-c-h-k	b-c-d-e-g-k	b-c-d-e-k

Key to notes:—a—Boiler diam., inside; b—Boiler diam., outside; c—Combustion chamber; d—Syphon; e—Feedwater heater; f—Limited cutoff; g—Booster or aux. loco.; h—Exhaust steam injector; k—Type E superheater.

Spot Repair Systems Can Be Flexible*

By A. J. Krueger†

The author cites two cases in which, under quite different conditions, reductions of 20 and 35 per cent in labor costs were effected as compared with former less systematic methods

THE progressive or spot system of repairing freight cars is a subject which may be approached from various angles and is a topic worthy of discussion due to the many advantages which it offers under proper conditions and to the fact that there are various ways in which the same results can be accomplished.

The plan, to be successful, must be well defined. It should be well understood by every one involved and a spirit of co-operation within the operating organization must exist.

The contract shop was, no doubt, the original user of the system identified as a progressive or spot method of building cars, and the character of the work in connection with the building of new equipment was one of the features which brought about this system due to the uniformity of the work. Therefore, the railroads themselves do the same thing with the diminishing number of wood cars and the increasing number of steel cars in service which are more uniform in construction and lend themselves readily to a method of this kind.

In the maintenance of all-wood freight cars it is not unusual for cars to be more or less frequently on repair tracks and few, if any, such cars can be given a general repair and then put into service with any assurance that a predetermined definite service life of several years will result with only minor repairs or scheduled intermediate repairs in the interim. However, with the improvement in car design and construction brought about by the co-operation and efforts of car designers, car builders and specialty manufacturers, it has become possible to anticipate general repair dates in advance for various series or classes of equipment and arrange car-repair programs accordingly.

Repairs May Be Scheduled Far in Advance

Take for example the modern freight car in which the center sills seldom need repairs other than that required due to accidents. Draft gears have been improved to the extent that they give considerable service life and many railroads believe that inspections made every two or three years help improve such service life. Steel roofs on cars of a certain design last from 7 to 15 years, or longer, and the all-steel ends, replacing the wood end which was the principal element of repair, requires hardly any repairs. All these bring about a uniformity in the construction of the car which makes it adaptable to a spot or progressive system of repairs and the same conditions can be applied for certain series or certain types of cars as in the case of building new cars. Such conditions manifest themselves to the railroad as to the necessity for establishing a spot or progressive system of repairs to increase output and reduce the cost of doing the work.

There are various ways in which cars might be repaired under a spot or progressive or specialized system of repairing the car as follows:

A—Using double-end tracks with various car spaces for each, position moving the cars as required.

B—Using a shop with dead-end tracks, establishing positions for various items of work and moving the cars as required.

C—Using one or more tracks, either dead-end or double-end, assigning men to specialized positions and moving the men and delivering the material to the car, permitting the car to remain at a fixed location until completed.

In the establishment of any spot or progressive system for repairing cars, it is desirable that the element of yard-engine expense should be given serious consideration by the mechanical department, which should make contact with the operating department in the establishment of such system so that all possible economies can be obtained. There are, no doubt, other methods or combinations which will work out advantageously in the repairs to freight cars and it is quite probable that examples of various methods or systems are in operation today on other railroads which are producing satisfactory results. However, any method established should be sufficiently flexible to adjust the output contingent upon the length of track, size of shop and other facilities.

Some mention might be made of the miscellaneous repairs which cars require from time to time and which might be specialized by providing separate locations for changing wheels and repairing door mechanism, etc., and it is my thought that light intermediate repairs of this nature should not be confused with the specialized general repairs to certain series freight car equipment. It would probably be better for such intermediate repairs to be made currently on light-repair tracks as required without specializing the work.

Where the double-end track is employed in the spot or progressive system, it should be, of course, of suitable length not only to provide space for the cars actually undergoing construction, but space should be reserved, dependent upon the output for cars, to be used when some position falls behind and to prevent a tie-up of the track or tracks.

To make the system economically successful, cars should be selected for repairs which are as uniformly in the same state of disrepair as possible and it is quite likely that any series of cars would meet this requirement if they had not had extensive repairs since the last shopping or since having been built.

The question naturally arises relative to the extent to which repairs should be made in so far as replacing material not yet worn out is concerned. If the cars are

* Abstract of a paper presented at a meeting of the Central Railway Club, Buffalo, N. Y., October 8, 1931.

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being repaired with the expectation of securing any definite service life before another shopping, any parts should be renewed while the cars are being given general repairs that will not have sufficient life for the anticipated period between shopping. For example, a steel hopper car requires renewal of side, floor, long hood and cross hood sheets. The hopper sheets are good for one year additional service. At that time the car will again have to be shopped for hopper sheets and considerable work performed at the general shopping will have to be performed again in order to make the application of the hopper sheets. The loss of material life in the old hopper sheets is offset by the duplicate labor costs at the second shopping and from an economical standpoint the hopper sheets with one year life should be renewed at the first shopping. On the other hand if the material in the car has sufficient service life to last for such a period of time that it cannot be economically renewed at the general shopping the material should be permitted to run until an intermediate shopping period.

Proper Renewal of Parts an Important Consideration

Sufficient material should be provided in advance so that no delays will occur because of material shortage. An inspection of a reasonable number of any series of cars will provide the means for making an intelligent estimate of material requirements for the entire series.

Proper material supply is one of the most important items in making the system successful. It is a well known fact in contract shop work in the building of new equipment for railroads that they have at times absolutely refused to start the work on the cars until the material is actually on hand or in sight. This feature alone has been repeatedly overlooked by railroads in the operation of their shops, resulting in expensive operation and loss of output. In forecasting the work to be done on the car when brought into the shop, it does not necessarily mean cutting the car out of service, but can be based not only upon the experience of the supervisors in charge of the series in question, but also by actual inspection of a representative number to know what the material requirements will be to make the repairs desired.

At most locations it has been found convenient to strip the cars at separate locations away from the repair track and in advance of going into the shop, making it possible to reclaim and salvage material in time so that it will be ready for use on the cars when they are repaired.

Systematic Repairs a Real Economy

As an example of savings which can be made through the use of specialized progressive or spot systems of car repairs, it might be interesting to describe the following:

A series of 36-ft. double-sheathed, fishbelly underframe, steel-end box cars were being repaired at several shops. These cars were about 10 years old and were receiving rather extensive repairs. Most of the wood parts and roofs were renewed on nearly all cars. The former practice had been to assign a gang of car repairmen to a car. These men stripped the cars at the point of repairs and then made all necessary repairs. This resulted in a large amount of refuse on the repair tracks to be picked up. The repairs to these cars were concentrated at one point where open-end tracks were available. A stripping track was provided and the cars were stripped at this location. Scrap cars were provided and all refuse was immediately put in the scrap cars. Material to be repaired and used over was sent to repair shop and from there to the proper location on the progressive track. Usable material was sent directly to the proper location on the repair track for reapplication.

On the first position, repairs were made to trucks, draft gears and miscellaneous steel parts. There were three active and three reserve car spaces for this position. On the second position, repairs were made to the frames and floor and three active and three reserve spaces were used. On the third position, sheathing application was made and on the fourth position, lining, belts, rail caps, etc. were applied. The third and fourth positions occupied two active and three reserve spaces. Safety appliances and doors were applied on the fifth position using two active and one reserve space. On the sixth position, permanent scaffolds were erected for the roofers who applied the roofs, running boards and roof platforms on one space. The safety-appliance gang followed the cars through this position for miscellaneous trimming when necessary.

Both plans were operated on the piecework basis of payment for all operations. When the specializing progressive or spot plan was placed in effect, we succeeded in negotiating lower prices for the work. The result was that we saved an average of 20.7 per cent, or about $20 per car in the labor cost for repairing the cars, while the workmen's piecework earnings did not decrease. The savings mentioned were for direct car-repair labor only and does not include strippers, air-brake men, painters, supplymen and other miscellaneous workmen involved.

A second track was available and occasionally was used with a duplicate force. Cars were set on the stripping track and on the lead to the first position once each day by a yard engine. The cars were moved from spot to spot by a tractor. This system had the disadvantage of requiring switching movements from both ends of the repair yard.

A series of 55-ton composite twin hoppers (the floor and sides were wood) about 10 years old and requiring 100 per cent renewal of floor and side plank, as well as all bottom sheets and hopper doors, had been repaired at various points by single gangs of car repairmen in much the same manner as the box cars.

The repairs to these cars were concentrated at a shop having four dead-end tracks each holding five cars. The cars were stripped on a stripping track located some distance from the repair tracks and set in groups to fill the tracks. In this case the men were moved. The first operation was performed by the truck gang who raised all cars and set them on horses. These men then started at the headend of the first track and repaired the trucks and draft gears going down on one track and back the next track. The next operation was performed by a first fitting gang who were in turn followed by the first riveting gang. The second fitting and riveting gangs followed; in turn came the side-plank gang and the floor gang. The side-plank gang handled all of the safety-appliance work and the floor gang adjusted the hopper-door mechanism. The truck gang followed through once more and placed the cars on the trucks. Once the gangs were in movement no delay was experienced throughout the entire repair period. These men were also on a piecework basis and we were able to negotiate new prices so that we were able to save 35.1 per cent or $59 per car on direct labor costs, including stripping, but not including painters, air-brake men, supplymen or other miscellaneous workmen.

Under this plan it was necessary for the yard engine to fill up the stripping and repair tracks when cars were required as it was not possible to have this work per-

formed daily at a set time as was the case with the box cars. The yard engine moved the cars to a sandblast and paint track and again out of the yard after being painted.

In my opinion a system of this type, properly operated, will produce a net tangible saving coupled with the fact that such system of repairing cars ties itself closely with the periodical general repairs and while it is certainly not desired to recommend wasteful uses of material, it is our opinion and experience that the combination of periodical repairs with some form of spot or progressive system will keep cars in better condition at a lower cost.

Cast-Steel Foundations For Railroad Equipment

(Continued from page 577)

mobiles to be loaded in each car. The door frame and end of the car, including the end sill, have been made in a single steel casting. The door-hinge butts are an integral part of this cast frame and the doors close into recesses which insure tightness when locked.

The examples which have been given here of the use of large steel castings in freight cars show the possibilities of this type of construction. It cannot be too strongly emphasized that the design of steel castings is a highly specialized profession. Too much care cannot be given to the design of the cast structure. While a skilled foundryman can make a poorly designed casting, the place to start to make the best job is on the drawing board, where a pencil and eraser can easily correct defects and make improvements. The success which has attended the use of these large steel castings and the great progress made in this field are due, in great measure, to the attention given by the manufacturers to the engineering phases of their products.

THOSE EARLY SLEEPING CARS.—A graphic description of one of the very early sleeping cars is found in a railway manual published in 1865. The writer said: "Within a year I have seen the oldest and the newest sleeping coaches, the remote past and the near future of railway travel at night. What a contrast the two present! The early sleeping car was low and narrow, and dark and stuffy. It wobbled and creaked and moved in all directions like a ship's compass. It had little windows that you could look out of only by bending double, and a narrow passage walled in by iron rods, one reaching to the roof from the back of every seat. On these poles the upper berths were hitched till they were ready for bedtime. The lower berths were narrow and so short that you had to lie in one like a half-opened pocket-knife with your knees in the air and the bed clothes pushed up like a tent. You did not need to be pious in order to thank Heaven when you got out of that car.

SPEAKING OF LOCOMOTIVES.—To look at locomotive is pretty from locomotive came the locomotive shed. It is fitted with many parts. First will start from the front portion. (1) Fitted with Chimney, the same is set on smoke box. The smoke box is set on the frame and the frame is set on wheels. Smoke box is extended which is called a boiler. And there is a boiler face plate which is fitted with whistle to avoid accidents and instruct public that train to start. Injection to inject water from tender to boiler fitted with vacuum brakes to stop a train running, & fitted with gauge column to show how much water in the boiler & fitted with hand brake to use when singine has no steam and fitted with a tender which carried the water. Top of the tender is the cool food for the Engine. The Engine is fitted with certain number of wheels & rods are fitted by the sides which are called side rods, other rods are connected from one end to the other. The biggest part on is called the big end. The small ends are called the little ends. The little end is connected to the portion which is held by the motion bars & extend to a cylinder contains a head & a rod fitted with steam chest contains valves & inlets & chest connected with steam pipes. Extends inwardly in the boiler with a throttle valve which is covered with big cap called dome the same leads on to the face plate fitted with a guide & regulator, that regulates the Engine to run. These fitted makes Engine look pretty. There is also nice cover made for the driver and fireman to be protected from sun, moon, rain & storm. So the parts of the locomotive and working of the same is a great pleasure to the driver, fireman, cleaner. Cleanliness is next to Godliness. To have a clean Engine makes the Engine pretty and the work a pleasure.—From a pamphlet on the operation of the steam locomotive for the guidance of Indian engineers, reprinted in the Railway Gazette, (London).

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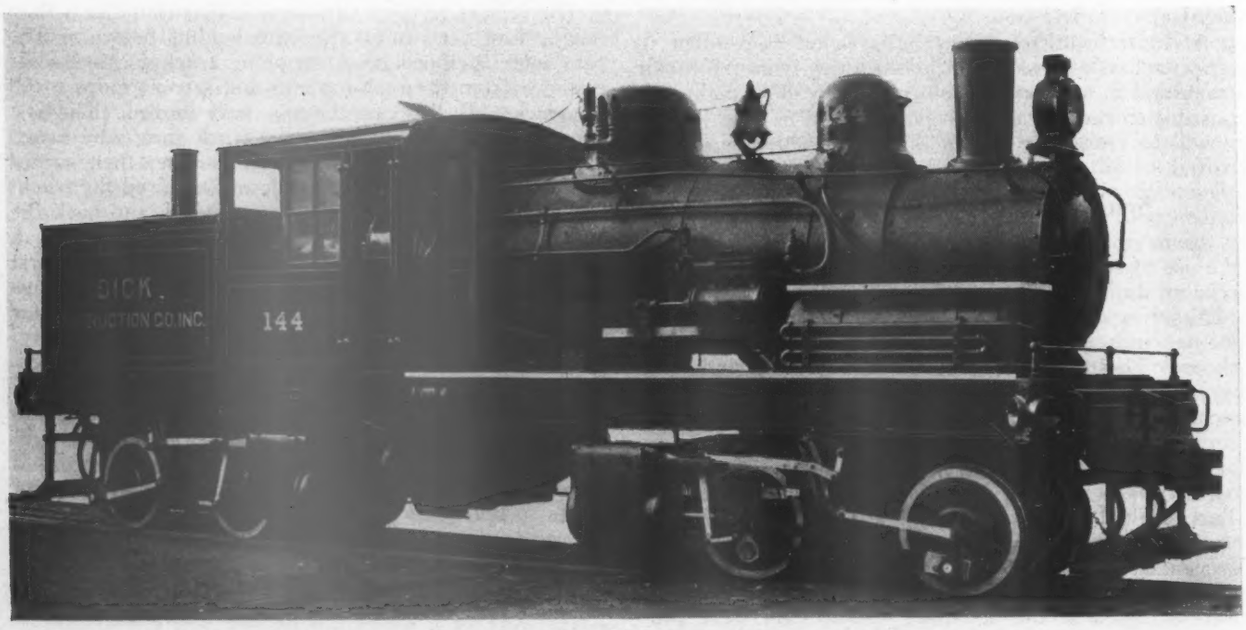


"Duplex" locomotive built by the Vulcan Iron Works, Wilkes-Barre, Pa.

Diameter of drivers, 33 in.; cylinders (four), diameter and stroke, 13 in. by 16 in.; boiler pressure, 200 lb.; tractive force, 30,000 lb. Weight in working order, 110,000 lb.

EDITORIALS

The 1930 Index

An index of the articles appearing in the 1930 issues of the *Railway Mechanical Engineer* will be printed and available for distribution shortly after the first of the year. It is available to all of our subscribers who wish to have it. It adds materially to the permanent value of the contents of the year's issues by making it easy to locate material on any subject after one's recollection of specific articles has become considerably dimmed. If you have been receiving a copy of the index in past years, you need take no further action; you will automatically receive a copy of this year's index. If you have not been receiving the index, but find that you would like to have it in the future, drop us a line and your name will be placed on the list of subscribers who are regularly receiving the index each year.

Cleanliness And Safety

An Interstate Commerce Commission inspector, speaking recently before a group of railroad men, made the statement that one of the things he had noticed on a certain road was the increasing tendency to allow the locomotives to run in a dirty condition. Dirt, grease and grime on locomotive parts are indefensible from several standpoints: They detract from the appearance of the locomotive, make the work of repairing and adjusting parts a much more difficult and disagreeable job, and, last and most important, dirty locomotive parts are a potential source of danger. Defective parts that are worn too much to be safely serviceable and cracked parts that are a positive danger cannot be discovered by an engineman or inspector if they are covered with dirt and grime.

There was a time when to keep a locomotive clean was a matter of pride. Possibly that day is gone but when locomotives are so dirty that it is next to impossible properly to inspect them in order to insure their safe operation it is another matter. There is no excuse today for a dirty locomotive; modern locomotive cleaning systems are so efficient in their functioning and so economical to operate that it would seem a matter of absolute necessity for a railroad to assure itself of the safety which is provided by the simple matter of cleanliness.

The Price Is Too Great

Considering the number of locomotives in interstate commerce in the United States, locomotive boiler explosions are of very infrequent occurrence. Last year (1930) the number of crown-sheet failures reported by the Bureau of Locomotive Inspection was 11; in 1929 the number was 17, and in 1928 it was 22. Because of the almost inevitable toll of deaths and the great destruction of property with which they are accompanied, however, crown-sheet failures stand in a class by themselves in relation to all other accidents caused by failures of locomotives and their appurtenances. There never will be justification for an attitude of complacence toward them. No goal short of complete elimination of such accidents can be entertained and, should that goal be reached, the destructive potentialities inherent in the locomotive boiler under pressure are ready to break forth the moment complacence causes a relaxing of discipline in the shops, in the enginehouse or on the road.

The report of an investigation of a recent boiler explosion clearly illustrates the necessity for observing all of the precautions which have been suggested and recommended in the annual reports of the Bureau of Locomotive Inspection, if such accidents are to be prevented. In the case in question the omission of the metal washers over the water-glass gaskets resulted in the complete obstruction of the opening at the top of the glass. This, it would appear, was the result of an inexcusable bit of carelessness on the part of an enginehouse or shop employee—a kind of carelessness which should not be tolerated, but which, unfortunately, will probably occur occasionally in spite of all of the precautions which alert supervision can take. Had the locomotive in question been provided with an additional water glass on the fireman's side of the back head, the probability of this accident occurring would have been reduced by much more than one-half. The cost of this single accident saved would probably have more than sufficed for providing all of the locomotives on the railroad with this additional safeguard and four experienced railroad men would have been saved to the service—and to their families.

Periodical Freight-Car Repairs

One of the high spots in the history of locomotive maintenance during the past 10 years was the inauguration of the practice of making periodical inspections and as a result of such inspections making the repairs and renewals of parts necessary to keep the locomotive in service until the next inspection date without the liability of failures in service. The question arises as to why the same system would not be highly desirable in connection with freight cars.

The experience of several railroads in the eastern part of the country has indicated not only that such a system is desirable but that it offers opportunities to improve materially the standard of freight car maintenance as well as to lower the cost. The practice of making a thorough inspection of all of the parts of the car at some stated period—say once each 12 months—cuts down the liability that a car will appear on a repair track, either on the home or a foreign line, as many times during a year as would ordinarily be the case. This is due to the fact that air brakes will be cleaned,

for example, at the same time that journal boxes are repacked to conform with A.R.A. rules, whereas it is the exception rather than the rule that both of these operations are performed at the same time under the present system, which is no system at all.

As running repairs are made at present, it is the practice to repair or renew only those parts that may have been reported defective or inoperative by the inspector. Why, for example, should one brake-beam hanger or hanger pin on a car be renewed and the car sent on its way when there is a possibility that other similar parts on the same car may be in such condition as to require their renewal at an early date, if not at present. It is a simple matter for a competent inspector to see and report defective parts and it would involve but little more work on the inspector's part to discover those parts which are in such condition that they will render but little more service before failure occurs.

A periodical inspection and more or less general repair by railroad of its own cars while on its own line would materially reduce the number of times the cars would appear on foreign repair tracks in the course of a year and, as a consequence, would enable a road to exercise closer control over freight-car repair costs by the elimination of many practices which are now a part of the necessary evil of having cars repaired on foreign lines. The very fact that from 60 to 80 per cent of the money spent by the average railroad for freight-car repairs is expended for running repairs indicates that here should be the broadest field of opportunity for making improvements. There are so many advantages to be gained by inaugurating a system of periodical repairs for freight cars that it seems worth while for mechanical officers to devote a great deal of attention to the subject at this time.

The Economy of Modern Locomotives

The definition of the term "modern locomotive" is subject to frequent revision. The qualifications which characterized the modern locomotive of 1920 are not those which characterize the modern locomotive of the present day. There is reason to believe that five years hence, further revisions in the definition may be necessary. Ten years ago the capacity of the modern freight locomotive was still measured by its maximum tractive force. It was built to haul tonnage. The time required to move its tonnage over the division, however, had not yet become a matter of general concern. Today the capacity of the modern freight locomotive is measured in terms of horsepower. It must be able to handle a heavy train and must move it over the road at relatively high speed—in some cases, indeed, at speeds approaching those of passenger trains. Its ability to meet these conditions is the result of increased boiler capacity. This increased capacity has been effected in part by a reproportioning of the boiler itself and in part by building into it the best that are available in the way of capacity- and economy-increasing devices.

In an article elsewhere in this issue is set forth specifically what the high horsepower output of the modern freight locomotive means both in the way of tonnage and speed capacity and in fuel economy in comparison with a locomotive of similar coupled wheel arrangement which would have met the specifications of a modern locomotive even less than ten years ago. The new locomotive, the results of the tests of which are set forth in the article, is of the 2-10-4 type, with a weight on drivers of 348,200 lb., has a total evaporating heating surface of over 6,000 sq. ft., a superheating surface of over 2,500 sq. ft., and 121.5 sq. ft. of grate area. This locomotive handled 15 per cent more tonnage in 9 per cent less time over the same division and with 17 per cent less fuel per 1,000 gross ton-miles than a 2-10-2 type locomotive with about 8 per cent less weight on drivers, but with about 17 per cent less evaporating heating surface, 45 per cent less superheating surface, and 27 per cent less grate area.

This comparison indicates what changes have been wrought in the basic proportions of locomotives within the past few years and what they mean in actual performance. Other instances are available where equally satisfactory improvements have been made by the substitution of modern locomotives for locomotives of similar driving-wheel arrangement less than ten years old —improvements which have been effected under a wide variety of operating conditions.

Obsolescence is not a matter of age or physical condition, but a matter of the advancement in the art of locomotive design and construction. There are few freight locomotives ten years old or older which are not today obsolete. Their retention in service, no doubt, is justified in specific cases, but the superiority of the modern locomotive has so frequently been demonstrated within the past three or four years that the burden of proof in such cases clearly belongs on the old locomotives. This approach to the motive power problem will avoid expensive mistakes.

Modern Power Plants Help Operation

Unsuspected strong and weak points in railway operation are showing up as a result of the critical analysis now being made on many roads in the interests of economy. Fuel consumption per 1,000 freight ton-miles and per passenger car-mile has continued to decline to hitherto unexplored low records despite the curtailment and, in some instances, the outright abolition of a fuel economy organization that assumed large proportions during the late era of expansion. This may be attributed in part to the persistence of the fuel economy idea, so thoroughly has it been drilled into all branches of the service during the last 20 years. More especially does the continuing improvement in fuel performance reflect the acquisition of modern power plants on wheels, superseding less efficient units that have virtually been retired from service since the decline in traffic has enabled the roads to operate exclusively with efficient motive power. Contrasted with the fuel economies thus effected, the present situation serves to emphasize the weakness in respect to a large number of stationary power plants at railway shops and terminals.

This matter has been neglected because, in many instances, railway officers have too little appreciation of the actual qualities of fuel consumed in these stationary plants, or the large demands for steam required of the average terminal power plant. A consumption of several hundred horsepower is not exceptional for a 30-stall enginehouse with small shop extension, exclusive of the added heating load in winter and steam for steaming up locomotives. The operation of a steam-driven compressor, of boiler feed, the washout and filling pumps for locomotives, and other auxiliaries, not to mention the steam hammer and other shop uses for steam, all con-

tribute to this load. Now it may be argued that a stationary power plant output of about 400 horsepower is as nothing compared to the output of a super-power locomotive hauling a tonnage train. But, let us consider this as an all-the-year proposition. The locomotive is tied up for repairs on an average about 10 per cent of this time. While not undergoing repairs, or stored, the average time between terminals, during which the locomotive is consuming fuel for the production of ton-miles or passenger car-miles varies according to the practice on various roads. Probably 33 per cent would be a high average for all locomotives of the type under consideration. Then these locomotives are by no means operated to develop their full boiler capacity for the entire time that they are in service between terminals.

After all is said and done, it will be found that the average stationary power plant at even a moderately small terminal will produce more horsepower, measured in pounds of steam, and consume more fuel for the entire year than the average super-power locomotive. Does not the efficient stationary power plant, therefore, deserve consideration in the interests of economy, as well as modern motive power units? Modern motive power has the advantage of increasing the tonnage capacity of an operating division, but modern stationary power plants, with ample reserve steaming capacity, also favorably affect operation by increasing the availability of locomotives when steamed up and held ready for service with steam generated in efficient stationary boiler equipment.

On many roads, the stationary power plant has been regarded as more or less of a side issue. Anything that would produce the steam would answer the purpose. The glare of a statistical searchlight turned upon fuel consumption per 1,000 freight ton-miles or per passenger car-mile left the power-plant coal pile in the shadow. Given the same intelligent consideration that has been bestowed upon the power plant on wheels, a proportionate expenditure upon railway stationary power plants will produce fuel economies as lasting and proportionately as substantial as already accomplished in road service.

Merchandizing Transportation

War times tend to stimulate mechanical developments; periods of business depression tend to retard them. Witness the stimulus given to air craft, oil and gas engines and radio during the last war, a stimulus which continued until 1930. Similar progress occurred with respect to railroad power and rolling stock. The years from 1918 to 1930 were years during which engineers in both the railroad and railway-supply industries saw many of their dreams and ideas become actualities.

It has been because of this remarkable progress made in mechanical equipment that engineering has been credited with being one of the major factors in bringing about the present depression in business. Engineers are accused of developing and producing new tools and mechanical facilities for mankind at too fast a pace to be absorbed. Mechanical developments, it is contended, moved too rapidly for our present methods of distribution.

Of course, the truth of such statements is open to argument, but the fact is that this depression is focusing attention on the problems of distribution, the most important phase of which is merchandising.

A large number of railroads, appreciating the changes which have come about with respect to merchandising railroad transportation, have enlisted all employees as traffic solicitors. Augmenting the efforts of the railroad sales force in this manner has accomplished worth-while results. Railroad men are becoming sales conscious. However, all the salesmanship ability, from the most expert down to the rankest amateur, natural or acquired, will not get far unless there is something to sell that is better than the other fellow's. The mechanical department has the job of procuring equipment which will convince the shipper and traveller that railroad transport facilities and service are superior to anything else available.

The job of merchandising railroad transportation has been brought into the offices, drawing rooms and shops of the mechanical department more vividly during the past two years than perhaps at any previous time in railroad history. It has been necessary to procure power which would haul increased tonnage at faster sustained speeds, and to have cars and locomotives that would possess maximum availability and long service life, with low maintenance expense in order to meet the onslaughts of continually reducing rates and lower earnings. Competition from other forms of transportation and from other railroads has required considerable time and effort on the part of the mechanical department to produce improved conveniences and facilities for traveller and shipper. It is generally conceded that much of the kind and character of service rendered by the railroads during the prosperous years preceding 1930 will be subject to a variety of modifications from now on.

Just what these changes will be, is still problematical. However, the past two years have seen constructive progress made toward the elimination of dust and foul air in passenger cars and the introduction of freight equipment specifically designed to recover traffic lost to the highways.

T. C. Powell, then president of Chicago & Eastern Illinois, gave an illuminating address on this subject at the 1930 convention of the Car Department Officers' Association, in which he strongly recommended that real consideration be given to shippers' requirements when designing freight cars. In his address, an abstract of which appeared in the September, 1930, issue, he contended that many of our present freight cars were real stumbling blocks in the way of securing freight traffic.

All things considered, there is good reason to believe that a large part of the problem of merchandising railroad transportation will fall to the mechanical department. Cars and locomotive service must be provided that traffic solicitors can sell. Equipment must be furnished that will get the business.

NEW BOOKS

DER WARMEUBERGANG IM LUFTKOMPRESSOR *(Heat Transfer in Air Compressors). By Dr. Karl Kollmann Published by Vereine Deutsch Ingenieur, Berlin, Germany. Illustrated. Price, cloth cover, 5 reich marks.*

A conspicuous gap in the information about machines with lower working temperatures, such as air compressors, is filled in the discussion of the results of a detailed calorimetric research on a two-stage air compressor which is presented in this book by Dr. Kollmann. This investigation embraced a speed range of between 60 and 160 r.p.m., a back-pressure range between 14 and 250 lb. per sq. in. above atmospheric pressure, and mean cooling water temperatures from 90 to 120 deg. F.

THE READER'S PAGE

Fitting Hunt-Spiller Bushings—A Question

To the Editor:

In fitting Hunt-Spiller gun-iron bushings on 2-10-2 type middle connections, side rods and main rods, and on the middle connection on 4-8-2 type passenger engines with floating bushings, if the bushings are bored straight and pressed in they close up by about 1/32 in. or less and have to be bored out. I found that, by boring the 2-10-2 type locomotive bushings with a .015-in. taper, they were straight after pressing them in. The middle connections are made .028 in. larger outside and .015 in. taper inside. Main rods are made .020 in. outside and .015 in. taper inside. These bushings are pressed in with a pressure of approximately 30 and 35 tons. Mountain type middle connections are made .020 in. outside and .010 in. taper inside. Boring these bushings with a taper on the inside saves time and eliminates boring out after they are pressed in.

Gun-iron bushings on the middle connections of 2-10-2 type engines wear thin on the flange side and have to be renewed after they wear down to ½ in. or less. They are ⅞ in. thick when finished, 13½ in. outside, 12 in. inside, 6⅛ in. long, and 5¼ in. under the flange. The main-rod bushing does not wear the flange, but becomes loose at times.

I would like to know the practice other railroads follow in fitting these bushings on locomotives of these two types.

W. E. Howard.

Answers to Air-Brake Questions Disputed

To the Editor:

I have been reading with considerable interest the questions and answers on air brakes in the *Railway Mechanical Engineer*, which, if I understand correctly, are compiled by an eastern road.

In the September, 1931, issue there are two questions, the answers to which, in my opinion, are not entirely correct. One of the questions with its answer is as follows: Name some defects in a brake valve which may prevent brake application on a 5-lb. brake-pipe reduction. Answer: Preliminary exhaust port restricted, resulting in slow rate of brake-pipe reduction; leaking automatic or brake-valve rotaries; leaking bottom gasket independent brake valve, U-pipe removed.

In this answer I take exception to that part stating "U-pipe removed," as in my opinion removal of the U-pipe would have no effect on the application of the automatic brake (No. 6 ET equipment).

The question reads: What would be the result if the U-pipe were removed or leaking? Answer: With the independent brake valve in running position it would be impossible to make a service application.

Regarding the answer to this question, I contend that with the U-pipe removed a service application would not be effected with either brake valve. My understanding is that the U-pipe is the pipe which extends from the independent to the automatic brake valve and is a continuation of the release pipe, its purpose being to incorporate the holding feature. If the U-pipe is removed or leaking, it would merely eliminate this holding feature, the operation of the brake not being affected in any other way.

The release pipe begins at the exhaust port in the equalizing-valve seat of the distributing valve and terminates in the rotary valve of the automatic-brake valve. This pipe can be cut off at three different places: at either brake valve, and at the equalizing valve of the distributing valve. When the equalizing valve of the distributing valve is moved by a brake-pipe reduction, the release pipe is cut off and no air will enter the release pipe at that time. This applies to the U-pipe, as it is a part of the release pipe. If the distributing valve did not "blank" this pipe, it would be impossible to operate the brakes on a second engine while double-heading.

I presume the questions in the September issue were on No. 4 Westinghouse equipment.

W. D. Herndon.

All-Year Oil With 50 to 55 Viscosity

To the Editor:

It is noticed that most of the articles and letters from readers published in the *Railway Mechanical Engineer* point out that more trouble is experienced with hot journals in the winter than in the summer. It is my experience that the exact opposite is true; that is, that more trouble is had with hot journals in summer months. The reason advanced is the use of winter-grade and very light viscosity oil too late in the summer months. I am identified with a railroad which operates in the northern part of the United States, where very low temperatures are encountered. Hot journals have been greatly minimized by using clean waste and a grade of oil with viscosity ranging from 50 to 55 at 210 deg. F. the year round.

Again it is noted in many of these articles that the grade of oil is usually stressed and that but little is said about the waste. It is equally important that a good grade new or renovated waste be used and that the journal boxes be kept tight to prevent dirt, water and other foreign matter from getting into the packing. It is necessary that the boxes and contained parts receive proper attention to get satisfactory results. Otherwise congealing of the oil during zero weather with resultant hot-box trouble cannot be avoided. It should be interesting, as well as instructive, to run a series of tests with waste of different mixtures to ascertain which mixture will hold the oil in suspension the longest. There are grades and mixtures of waste that have a wide variety of ability to feed oil to the journal and hold it in suspension in the journal box.

As evidence of winter and summer performances on this road, with year-round oil having a viscosity range of 50-55 at 210 deg. F., records show that an average of 325,000 miles per hot box was attained in the severe winter months. During July and August, under careful supervision, this average decreased to 137,000 miles, the trouble in the latter months being due largely to cars of foreign ownership. Frequently the packing has been removed from a box on a foreign car that has

run hot and the oil extracted. It is usually found to be very light, not a sufficient amount of oil being held in suspension in the waste to produce proper lubrication. Hence, because of the dry condition of the waste, a potential waste grab is in evidence.

It is my opinion, based on actual observations, that the exceptionally large number of waste grabs detected during the summer can be ascribed to the operation of cars with a low-viscosity oil applied during the winter. In such circumstances it will usually be observed that the light oil has settled largely to the well of the box, allowing the waste on top to become dry and fluffy, inviting waste grabs and thus preventing proper lubrication.

It is agreed that where cars get into territories having extremely low temperatures ranging from 50 to 75 deg. below zero, as stated by "An Oil Man," in the September, 1931, issue, a cut-back oil could be used advantageously with the understanding that only the best grade obtainable should be purchased for this purpose and then used only in moderation. The opinion, however, is still held that the viscosity should never be below 50 or 55 at 210 deg. F., with a minus zero pour point. It is not believed that an oil with a pour point minus zero 50 to 75 is necessary at any time.

It may be of interest to state that on this railroad the same quality of oil is used in both freight and passenger equipment. Seldom has a passenger train been delayed because of a hot journal and, when such trouble has developed, it was usually with a passenger or milk car of other ownership.

The remarks made in the foregoing paragraphs are based on experience gained from a two-year test conducted with year-round oil. The writer of this letter does not profess to be an authority on lubrication, but, like many a railroad man interested in the subject, is striving to do something beneficial and will welcome constructive criticism.

MASTER CAR BUILDER.

Counterbalancing Locomotives

TO THE EDITOR:

In the July, 1931, issue of the *Railway Mechanical Engineer* there is mentioned a new method of computing the counterbalance of locomotives, the results of which were stated to be very satisfactory, the engines so balanced being improved in riding qualities. I should like to know this method.

I should also like to know the answers to the following questions:

1—What percentage of the reciprocating weights are balanced?

2—Is the percentage varied for different diameters of drivers, or is the piston speed used as a limiting factor in the speed of the reciprocating parts?

3—Can the percentage be increased for three-cylinder engines?

4—By how much (roughly) can the hammer blow be reduced by using three-cylinder engines?

5—What increase (percentage or otherwise) of axle load due to dynamic augment would be considered fair?

6—Has the lead-pocket type of counterbalance gone out of favor and what were its disadvantages?

7—What, roughly, would be the weight of reciprocating parts for one side of a modern box-type locomotive?

8—With heavy power, is it sometimes necessary to adopt a larger wheel to obtain satisfactory counterbalance?

9—On heavy power does special provision have to be made on the leading truck for the "elbowing" motion? Is the four-wheel engine truck superior to the two-wheel in this respect?

10—Does the tandem rod drive involve placing a reciprocating balance weight in the following pair of drivers, and does the adoption reduce the hammer blow and make longer two-cylinder units economically practicable (apart from bearing pressures)?

K. F. GREEN,
North Fremantle, West Australia.

[Mr. Green refers to the report of the A.R.A. Committee on Locomotive Design and Construction an abstract of which was published in the July, 1931, issue, page 352. In that report, the sub-committee on counterbalancing of locomotives referred to its 1930 report which included a paper on crossbalancing. An abstract of this paper appeared in the August, 1930, issue of the *Railway Mechanical Engineer*, page 448. —EDITOR.]

A Prophecy, A Promise or a Threat?

TO THE EDITOR:

Occasionally the *Railway Mechanical Engineer* raises its lily-white hands in holy horror and proceeds in its editorial columns to politely rake some old established mechanical department practices over the coals. That was my reaction after reading your editorial in the November, 1931, issue on "Expensive Economies."

This shop manufactures replacement parts for some locomotive appliances and does a fairly good job, even if the materials are not the same nor workmanship as fine. True, we do not keep as elaborate a system of books to show our costs as do the manufacturers. Our overhead, etc., are absorbed elsewhere. But we do know our labor and material costs. Shop manufacturing is a big help toward solving the problem of continuity of shop labor. Forces and shop equipment can be used to manufacture parts on stores-department orders when there are no locomotives going through the shop.

Right now, when budgets have been cut to the bone, labor forces reduced to the minimum, and we are robbing cars, as well as locomotives, to keep what we have that is in good condition on the road, because the storehouse in short, we have some real practical problems to solve in which theoretical premises are not much help.

The Egyptian task masters forced the Israelites to make bricks without straw. It is my understanding that the period of depression at that time lasted seven years and straw (like locomotive parts are now) was hard to get. However, Bible commentaries inform us that seven years of famine in Egypt was an event which happened about every fourteen years because of the eccentric behavior of the River Nile. To the Ancient Egyptians, the Nile was an important factor in their economic life. It furnished not only fertile soil to the fields, but also transportation.

This depression has lasted two years. Maybe there are five more to go. Thus far the Interstate Commerce Commission, our state regulatory bodies and others, including certain senators from the middle west, are still hardening their hearts. Unless they get over their stubbornness and see the light, we can expect the "Nile" of the United States (I don't mean the Mississippi or the Warrior rivers, but the railroads) to be as eccentric as the old Nile of Egypt. We will continue to do the best we can to keep cars and locomotives on the rails, even if it means manufacturing a lot of necessary parts in the old shop.

A READER.

With the Car Foremen and Inspectors

Thirty-gallon pressure feed tank and equipment used in spray-washing cars

Spray Washing Of Passenger Cars

PASSENGER-TRAIN cars received at the backshop for general repairs must be thoroughly washed inside and out to provide clean surfaces, especially when repainting operations are involved. Until April, 1931, the hand method had always been employed in washing cars at the Milwaukee (Wis.) shops of the Chicago, Milwaukee, St. Paul & Pacific, but, since that time, the spray method has been used with highly satisfactory results, including a saving of 12.23 man-hours, or $6.97, per car cleaned. The following DeVilbiss equipment was purchased for spray washing operations: Two 30-gal. pressure feed tanks, mounted on wheels; four washing guns; four special material-spray guns; and miscellaneous 3/8-in. and 1/2-in. air and fluid hose in 50- to 100-ft. lengths, all installed at a cost of slightly over $800.

Former Hand Washing Methods

Under the hand washing method, the washing force was divided into inside and outside gangs, and these two large gangs were split into smaller gangs of two, four or any number of men that may have been required to wash a car within a given time. Each washer would work more or less independently of the others in the gang; that is, he cleaned only his proportion of a car.

The operation consisted of each washer filling a small bucket full of soap (or acid) and water from the supply barrels located on the wash tracks. He then heated the liquid by forcing steam into it. The man then applied the liquid on the car with a brush or sponge, scrubbed the area and then rinsed it off with a sponge. Each bucket full of liquid would wash only a small area, so constant refilling was necessary.

The slowness of the operation was due to several factors. Constantly refilling the buckets consumed much time, which was lost motion. The application of the cleaning liquid, the scrubbing of the car and the rinsing off, done in each case by hand with a brush or sponge, permitted only small areas to be washed at a time, and it was tiresome work. The entire operation was performed with crude hand tools, it being merely drudgery and offering no incentive for speed or good workmanship. The work was attractive to only the lowest class of unskilled labor.

Spray Washing Method

In April, 1931, an experiment was started on washing cars by the spray method. Two gangs were organized and each gang was equipped with one spray outfit. The men of each gang work together to clean the entire outside or the entire inside of a car. The present or-

Average Cost of Washing Passenger-Train Cars by Spray Method Compared with Former Hand Method*

Class of cars handled	No. of cars washed		Former hand method performance time, man-hours		Present spray method performance time		
	Inside	Outside	Inside	Outside	Date	No. of sprayers	Man-hours spent
Express—wood	7	8	140	144	May 11	4	32
Express—steel	5	5	152	120	May 12	4	32
Express—s.u.f.	1	1	20	18	May 13	4	32
Mail & express—steel	..	2	...	48	May 14	4	32
Express refrigerator—s.u.f.	1	2	6	20	May 18	6	48
Passenger & express—wood	1	1	20	18	May 19	6	48
Passenger & express—steel	1	1	32	24	May 20	6	48
Coach—steel	..	1	...	24	May 21	6	48
Diner—steel	..	2	...	48	May 25	6	48
Sleeper—steel	..	5	...	120	May 26	6	48
Total	16	28	370	584			416
Grand total	44 jobs		954 man-hours			416 man-hours	

Comparative Data

Item	Former hand method	Present spray method
Average man-hours spent per job	21.68	9.45
Man-hour saving made per job	....	12.23
Cost per man-hour	$0.57	$0.57
Average cost per car cleaned	$12.36	$5.39
Cost saving made per job	....	$6.97

* Based on cars washed by spray during the experimental period, May 11 to 26, 1931, incl.

Spray washing the interior of a passenger coach

ganization consists of two men in the outside washing gang and three men in the inside washing gang. At present, each gang washes two cars per day.

The operation consists of the gang filling a portable 30-gal. feed tank with a hot chemical solution, and by means of compressed air it is sprayed on the car from a hose and nozzle. Another hose is connected onto the water line and used to rinse off the car. For exterior car washing, one man handles the solution spray and the other handles the water hose. Both washers scrub the car to loosen up the dirt. For interior washing, the method employed is the same except that a third man is utilized for scrubbing. This extra man is necessary to properly balance the inside work with the outside work. Interior washing is a larger job than outside washing, due to the greater area to be cleaned, the woodwork and light colors, and the need for exercising greater care to obtain a clean job.

The speed of the operation is due to several factors. The large capacity of the solution tank and the feeding of the liquid through a hose to the car permits continuous productive work. The application of the solution and the rinsing is done by hose; the scrubbing by hand. Thus the hand work is cut from three operations to one. This permits large areas to be easily washed at a time. The entire operation is designed to afford easy, interesting work. Even the hand scrubbing is minimized by making the cleaning solution "eat" the dirt.

The washing problem is to obtain clean surfaces at a fast rate with a minimum amount of hand work. Experiments and experience have furnished several basic facts. Cars must be scrubbed to loosen up the dirt. The cleaning compound used must be one that will not harm the paint and varnish but will "eat" the dirt so as to minimize the scrubbing. Cleaning conditions vary with the individual cars so that no single mixture of a cleaning compound will meet all requirements. The best results are obtained when the cleaning solutions and the rinsing water are applied to the car hot. Force (pressure) is desirable as the final rinsing step but the mere application of cleaning solutions or water by high pressure will not clean a car for painting. Speed in washing cars can only be obtained by substituting machine methods for hand methods. The procedure to be followed in washing cars is practically the same as that employed in washing one's hands or clothes.

The steps to be followed in washing the exterior of a car to obtain the best results are: Spray the cleaning solution over a large area; scrub the moist area; again spray the cleaning solution on the area; rinse off with warm water (water at city pressure); rinse off with warm water (water at shop air-line pressure).

The cars washed by spray are as clean as those washed by hand and are rinsed off better. On steel cars where the rivets are exceptionally dirty, being heavily caked with dirt, a strong solution that loosens this dirt is applied over the rivets in advance of the regular spray washing.

Savings by the Spray Method

When the washing of cars by the spray method was first started, one gang was employed, then a second gang was started, and in May, the third gang started operation. The sprayers were recruited from the washing force.

The original force consisted of 19 washers at a daily pay-roll cost of $86.64. Due to the spray method, it was possible to lay off ten washers, which is a pay-roll saving of $45.60 per day. A 3-car-per-day output was maintained with the reduced force.

During the experimental period of May 11 to May 26, 1931, 44 jobs were washed by the spray method at a cost of 416 man-hours. Had these jobs been done by the hand method, they would have required 954 man-

Spray washing operation on a mail express car

hours. The saving per job due to the spray method was 12.23 man-hours, or $6.97. Details are given in the table.

The reduction in the man-hours per job amounted to 56.4 per cent, and the pay-roll reduction to 52.6 per cent, or practically the same. At present, the washing force consists of 5 men who turn out 2 cars per day. Were cars still being washed by hand, a force of 12 or 13 men would be required. The cars washed included all types, such as express, coach, sleeper, diner, parlor, etc. Both the insides and the outsides of these cars are spray washed.

The equipment used, as enumerated in the opening paragraph, has several advantages. It is portable and can be used anywhere in the shop or yard where air and water connections are present. Efficient shop operation requires this flexibility. It will permit quick, economical changing from one chemical solution to another, which is essential for the proper washing of our cars. The containers will carry a sufficient quantity of cleaning solution to provide economical washing. They will also permit solutions to be kept hot, and allow the equipment to be easily cleaned out, especially at the close of the day, without excessive waste or cost. The equipment gives a spray but no fumes. The equipment represents only a small investment and will work in conjunction with the air and water piping already present in the shop. Hot water for rinsing is provided by injecting steam, from the present steam pipes, into the water. Cold water passes through a steam jacket, where the steam and water are mixed to furnish hot water. Each of the 10 assigned wash tracks is provided with hot water, and the rinsing hose is connected directly onto the water line at the steam jacket.

Although no close check was made upon the material used under the spray system as compared with the hand system, there is seemingly little, if any difference in the amount and cost. The spray washing is under the direct supervision of the painter foreman.

Spray Cleaning of Trucks

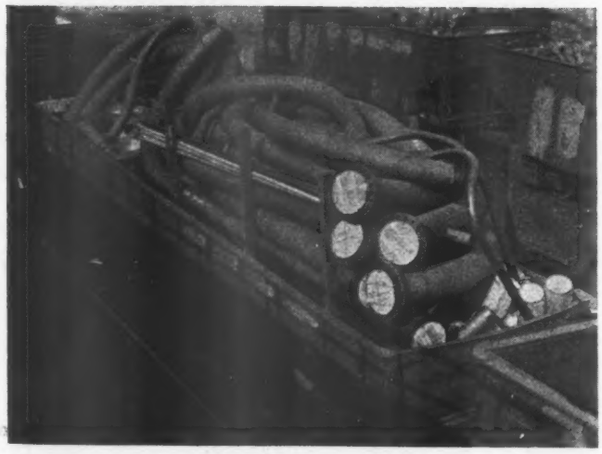
When spray washing of car bodies proved a success, the wash tracks took over the work of cleaning the trucks under cars. Formerly the dirt was blown off of the trucks by compressed air in the yard. This work cost about one man-hour (57 cents) per day and required at least two extra movements on the transfer table. The trucks are now washed along with the outside of the cars, thus eliminating the extra cost and movement. Furthermore, the trucks are cleaned much better than they formerly were. No man-hour or direct monetary saving has been claimed for truck washing.

Method of Loading Curved Pipe

IT is not unusual for car inspectors located in pipe or mill districts to be called on by shippers for advice as to the safe loading and securing of loads such as the one shown in the illustration, and for which no provisions are made in the A. R. A. loading rules.

The pipe loaded in this car was originally straight lengths which had been shipped to a pipe-bending plant and which came out in many shapes.

While any safe method of loading would be satisfactory, it is sometimes difficult to locate the side stakes in the exact location desired due to lack of inside stake pockets. This can be overcome by cutting out one or two rivets which pass through the side sheets and stakes and inserting bolts through the wood stake and car side.



Loads of this kind present a real problem

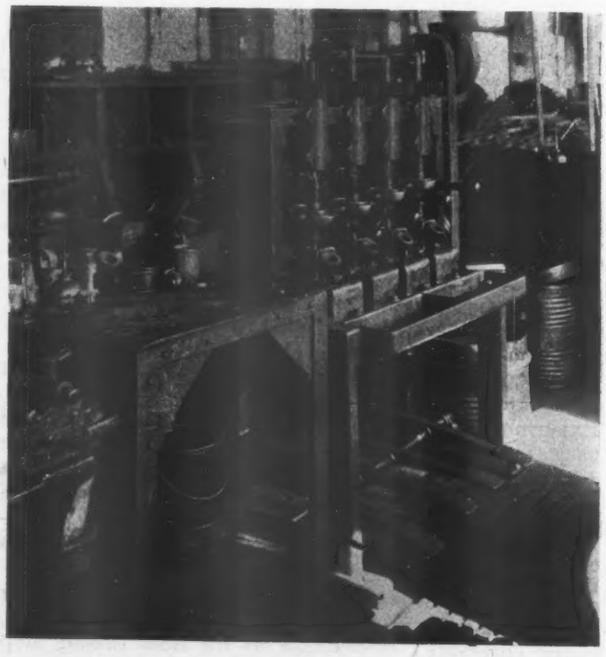
Because of the extreme weight of the pipe on the farther end of this car it was necessary to increase the size of the stakes to 8-in. by 8-in. and securely wire the pipe to this stake to prevent the shifting of the load in transit.

A most important factor in the loading of curved pipe is to see that the load is equalized throughout the car to prevent leaning and eventual shifting.

Angle-Cock Grinding Machine

By a General Foreman

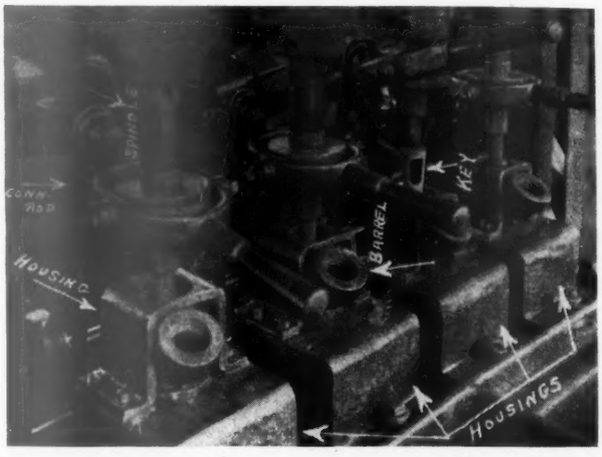
AN angle-cock grinder was described in the July, 1931, issue of the *Railway Mechanical Engineer*, page 373. From the description and illustration show-



Angle-cock grinder made from a scrap nut-tapping machine

ing the machine, it appears that the wearing parts are placed under the spindles so that, when grinding, the abrasive spills onto the wearing parts thus causing considerable wear. The grinding machine shown in the illustration overcomes this objection.

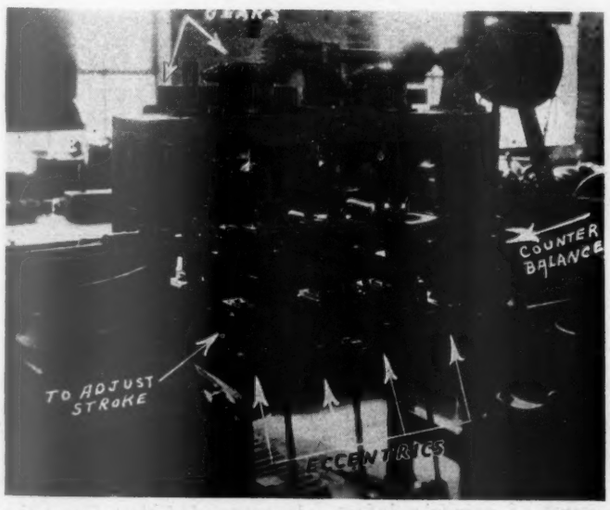
It is made from a scrap nut-tapping machine. The chucks for holding the nuts and the spindle chucks for



Front view of the angle-cock grinding machine showing the housings for holding the work

the taps were removed and housings for holding the work were substituted. The grinding head is keyed to the spindle to facilitate application and removal. To raise and lower the grinding head each spindle is provided with an operating handle and foot treadle. The foot treadle is connected to the extension arms of the handles with a goose-neck connecting rod. The raising and lowering mechanisms are counterbalanced so that the workman can operate the machine with comparatively little effort. A shaft provided with four eccentrics reclaimed from a scrap piston-ring grinder provides the required vertical movement of the grinding heads. The eccentrics are directly connected to the extension arm of the handle.

The gears and operating mechanisms are located above the work. It is impossible for the grinding compound to get into the gears and cause undue wear to the rubbing surfaces. This machine was in service a number of years previous to its conversion to an angle-cock grinder, but there has been practically no maintenance required to keep it in operation since its conversion. One-inch angle cocks may be ground by inserting a small iron block in the housing under the angle cock.

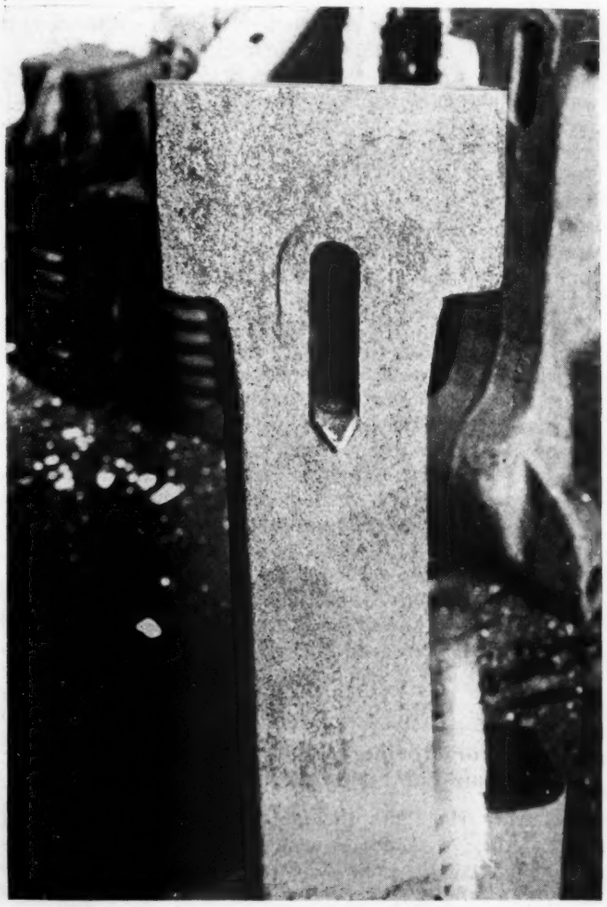


Rear view of the angle-cock grinding machine showing the eccentric and treadle arrangements

Taking Out Coupler Slack

ENLARGED keyways in couplers are responsible for a great deal of slack and while this wear can be corrected by welding it is not always convenient to do so due to the fact that at many of the smaller car-repair tracks no facilities are available for welding.

A satisfactory arrangement has been discovered by a car foreman on an eastern railroad, which consists of the application of a wrought iron shim or filler in the extreme end of the key slot. This filler can be made in



Shims in the end of the keyway will take up the slack in the couplers

various sizes and kept available in the car-repair yard for use when needed. The important thing is to get all, or as much of the slack as possible out of the coupler and by having several sizes of shims a suitable one can be used to make a tight fit. These shims can be manufactured in the larger forge shops on machines, or they can be made during intervals when the blacksmith in the car shop is not too busily engaged in other work.

Decisions of Arbitration Cases

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Failure To Apply Arch Bar Of Standard Section

On May 6, 1930, the Clinchfield applied a second-hand arch bar measuring 1⅜ in. by 4½ in. by 83 in. to S. A. L. car 90196 at Erwin, Tenn., on account of the old bar being broken, owner's defects. The repair card as originally rendered did not show the dimensions of the bar removed. This information was added under date of September 9, 1930, at the request of the car owner and showed the same size bar applied as was removed. At the time the repairs were made, Rule 26 required that arch bars applied to 80,000-lb. capacity cars should be A. R. A. standard; namely, 1¾ in. by 4½ in., or 1½ in. by 5 in. Inasmuch as S. A. L. car No. 90196 was an 80,000-lb. capacity hopper car equipped with arch-bar trucks to which standard A. R. A. arch bars were applicable, the car owner contended that the application of the 1⅜-in. by 4½-in. bottom arch bar constituted wrong repairs and that the charges should be cancelled in accordance with paragraph 4, Rule 87, because the repairing line did not furnish a defect card at the time the repairs were made. The Clinchfield claimed that joint evidence had to be secured and repairs corrected before it could be required to cancel its charge. The second-hand arch bar applied to car No. 90196, the Clinchfield claimed, had been removed from a dismantled S. A. L. car of the same series. For that reason it contended that the 1⅜-in. by 4½-in. arch bar was the owners' standard for the car and that the application constituted permanent repairs and could not be considered as temporary repairs for which no charge could be made. The cancellation of the charge, it claimed, was equivalent to assuming the expense of repairs, which is prohibited by Rule 87.

The Arbitration Committee rendered the following decision: "The contention of the car owner is sustained under fourth paragraph of Rule 87, 1930 Code."—*Case No. 1680, Seaboard Air Line vs. Clinchfield.*

Charge for Moving Lading To Repair Car Sustained

On May 19, 1930, the Georgia & Florida repaired S. A. L. car No. 28829 at Douglas, Ga., the charges billed against the Seaboard Air Line amounting to $154.46. Among the several items of work done was one for renewing ten linear feet of siding. To do this work the load was removed and restored at the A end. The car is a double-sheathed, steel-frame box car. The Seaboard Air Line claimed that it was not necessary to remove the load to renail the siding. It contended that if the car had been improperly loaded so as to push the siding out, the delivering line should have been required to issue authority to transfer or adjust the lading, as the removal and replacement of the load in that instance was not a proper charge against the owner. It pointed out that the car had $\frac{13}{16}$-in. outside sheathing and inside lining, that the steel upper frame was riveted to the outside of the side sills and side plate, making a solid superstructure between the siding and the lining, and that the repair card showed that it was unnecessary to remove or replace any of the steel upper frame; neither was any of the lining defective. This, the car owners claimed, indicated that the lining and frame were intact. The S. A. L. also contended that a space of 3 in. between the lining and sheathing was sufficient to enable the car force to renail the sheathing without disturbing the load. The Georgia & Florida in its statement pointed out that the car was loaded with bulk phosphate rock. It stated that while the car was on the rip track ten linear feet of outside sheathing was pulled back in place and renailed to the bottom-sill nailing girth, to prevent the contents of the car sifting through the opening. To perform this work properly the Georgia & Florida contended it was necessary to break the seal on the car door and remove and replace the bulk phosphate rock to remove the pressure on the siding in order to pull it back and renail to the side-sill nailing girth. The repairing line in its statement pointed out that the car was loaded on the Seaboard Air Line and delivered to the Georgia & Florida at Madison, Fla., at which interchange point neither railroad has an inspector. It contended that this was not a defect for which it could have called on the delivering line for transfer authority for the reason that the car could be repaired under load, which was done.

The Arbitration Committee in its decision stated: "Charge for R. & R. of lading to renail the siding is in accordance with Item 421 of Rule 107. The contention of the car owner is not sustained."—*Case No. 1681, Seaboard Air Line vs. Georgia & Florida.*

Chill-Worn-Flat Wheel Incorrectly Reported

On September 26, 1929, S. A. L. car No. 13861 was repaired by the Atlanta, Birmingham & Coast at its Elyton, Ga., shops, when one pair of wheels were renewed on account of one wheel being "chillworn flat," the mate wheel being second hand, and a second pair renewed because one wheel had a worn flange. The mate wheel of the second pair also had the same defect which was discovered at the time by a remount gage. The owners requested the A. B. & C. to cancel the charges for the chill-worn-flat wheels and cited case No. 894 as being parallel. However, the A. B. & C. changed the repair card to read "Worn through chill flat," and refused to make any adjustment, claiming that practical men considered this term as describing an owner's defect. The Seaboard Air Line claimed that the terms "chill worn flat" or "worn through chill flat" are not recognized in the rules. It contended that the A. B. & C. changed its repair card after the bill had been rendered, which is prohibited by the rules, and also according to Cases 814 and 834. The S. A. L. also claimed that the corrected repair card which showed the wheels as worn through chill flat still indicated that the wheel was slid flat and that the repairing line should cancel its charge against the owner as per Rule 68. The A. B. & C. pointed out in its statement that the chief joint inspector made an inspection of the car at Birmingham, Ala., at the time it was received from the Louisville & Nashville, and issued his defect card covering a cut journal. On the same day the A. B. & C. forces at that point removed three pairs of wheels for the following defects already cited and declined to cancel the charge for the flat wheels, contending that the wheels were removed on account of owner's defect. It contended that Case No. 894, which was cited by the S. A. L. as being parallel,

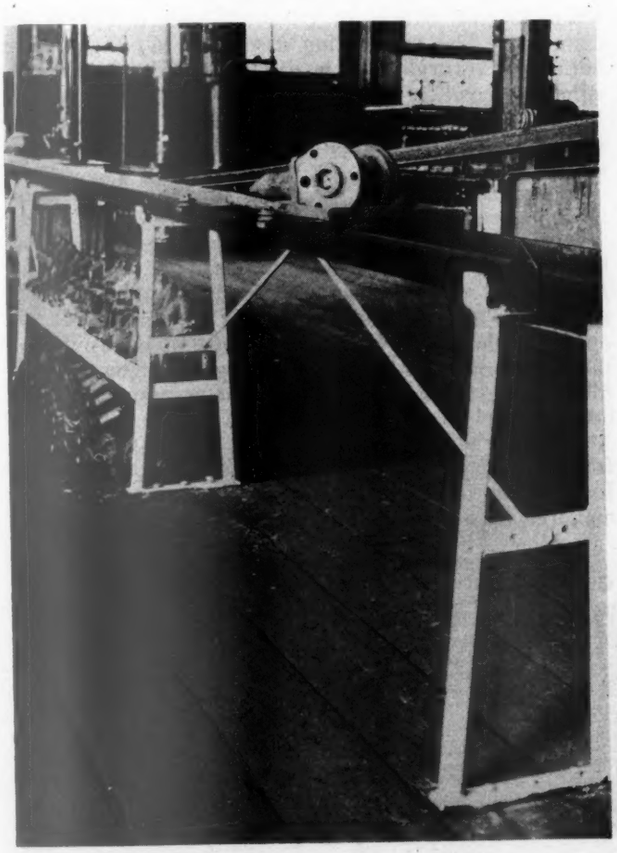
had been made void by paragraphs 102 and 103 of the A. R. A. Wheel and Axle Manual which had been issued since the time the decision in Case 894 had been rendered, and said: "It is felt that the Seaboard Air Line is technical in its exceptions, because the owner assumes that the flat spots on these wheels were slid when the records of the actual inspection of the wheels developed that these were not slid-flat spots."

The following decision was rendered by the Arbitration Committee on April 10, 1931: "The contention of the Atlanta, Birmingham & Coast is sustained. Car owner is responsible on basis of Rule 73 and paragraphs 102 and 103 of the Wheel and Axle Manual."—*Case No. 1679, Seaboard Air Line vs. Atlanta, Birmingham & Coast.*

Progressive System of Handling Triple Valves

TO eliminate the excessive cartage of triple valves in the air-brake shop the arrangement shown in the illustration was adopted by one railroad. A 15-in. channel is mounted on legs 36 in. from the floor and is of sufficient length to transport the triple valves past the various benches where workmen are engaged in performing their respective parts of the cleaning or repair operation. A number of carriages equipped with chair rollers are loaded with triple valves at the stripping bench and as they pass the workmen they are removed, repaired and replaced on the carriage and moved to the next operation. A ½-in. by ½-in. angle track located on the right of the channel is provided to return the empty carriages by gravity to the stripping bench.

This arrangement eliminates the necessity of trays or other cartage in the air brake shop and while presenting a systematic appearance also speeds up the work of repairing and cleaning, and reduces the cost per triple valve handled.



A simple conveyor channel carries the triple valves past the work benches

Questions and Answers For Air-Brake Foremen

FOLLOWING is the fifth of a group of questions and answers selected from the instruction pamphlet recently revised by an eastern railroad:

Q.—Explain how to adjust high-speed reducing valves or brake-cylinder safety valves on engines equipped with the combined automatic and straight-air brake? A.—Adjust the straight air-brake reducing valve for about two pounds higher pressure than the standard setting of the high-speed reducing valve or safety valve to be adjusted; place the straight-air brake valve in application position, then manipulate the adjusting nut of the high-speed reducing valve or safety valve until a slight amount of air discharges from the exhaust of the high-speed reducing valve or vent holes in the safety-valve spring box; then reset the straight-air-brake reducing valve to 45 lb.

Q.—Explain how to adjust the high-speed reducing valve on engines not equipped with the straight-air brake? A.—Make a continuous service reduction of 30 lb. from an initial brake-pipe pressure of 110 lb. and note the pressure at which the high-speed reducing valve functions as indicated by the gage. If higher or lower than the required pressure, manipulate the regulating nut until the required pressure is returned after adjustment is completed. Repeat this operation if necessary until proper adjustment is made.

Q.—What test is required with respect to the independent brake valve? A.—It should be placed in slow-application position noting that the brakes apply; then placed in lap position, noting that brake-cylinder pressure remains constant.

Q.—What should then be done? A.—Release the brakes, then place the independent brake valve in quick-application position noting that the brakes apply at a more rapid rate than in slow-application position.

Q.—What brake-cylinder pressure should be obtained? A.—45 lb.

Q.—What should be noted with respect to distributing-valve operation? A.—That it operates noiseless and without vibration.

Q.—What should be noted with respect to the brake-valve handle when released? A.—That it returns to slow-application position.

Q.—What brake-cylinder pressure should be obtained through the straight-air brake valve? A.—45 lb.

Q.—What should be noted following an independent or straight-air brake application when the independent brake valve is placed in running position, and the straight-air brake valve placed in release position? A.—That the brakes release.

Q.—With brakes fully applied and with the automatic brake valve in lap position what test should be made of the independent brake valve and the distributing valve? A.—The independent brake valve should be alternated between independent running and release position at the same time noting that it is possible to reduce the brake-cylinder pressure in steps of about 7 lb.

Q.—What may cause failure of brakes to apply when the independent brake valve is placed in application position? A.—Reducing valve not properly adjusted; slow application port in the independent rotary valve or application-cylinder pipe obstructed; distributing-valve supply-pipe cut-out cock or brake-cylinder cut-out cock closed; bad leak from the application cylinder; distributing-valve release pipes or safety valve leaking or not properly adjusted.

Q.—What may cause a failure of the brakes to remain applied after an independent application with the independent brake valve in lap position? A.—Leak in the application chamber or cylinder, application-cylinder cover gasket, application-cylinder-pipe or fittings, distributing-valve release pipe or fittings, safety valve, independent rotary valve, seat or lower gasket or automatic rotary valve or seat.

In the Back Shop and Enginehouse

Maintaining Bearings On Motor-Car Engines

By E. O. Whitfield

THE New York, New Haven & Hartford has developed a large number of special tools and fixtures for use in connection with the maintenance of rail-motor cars. Some of these devices have been referred to in previous articles by the writer which have

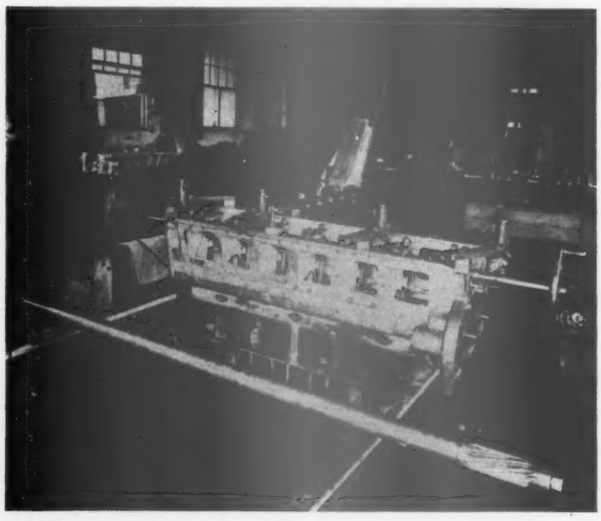


Fig. 1—Engine set up for boring the crank-shaft bearing seats

appeared in preceding issues of the *Railway Mechanical Engineer* while others have been described in detail.

Undoubtedly one of the most important jobs in a shop devoted to the maintenance of rail motor cars is the maintenance of engine bearings, especially the main bearings. Accuracy and fine workmanship are essential.

Referring to Fig. 1, the cam-shaft reamer shown lying across the two horses in the foreground is one of the tools developed in the New Haven, Conn., shops. The special attention of the reader, however, is referred to the boring bar which is shown inserted through the crank-shaft bearing seats of the engine in the foreground.

The bar *A*, which is shown assembled in Fig. 2, is fitted with fly-cutters *H* and is turned with the hand wheel *D*. This handwheel fits on the end of the bar. It is also used for other operations in connection with facing bearings, as shown in Figs. 3 and 4.

It is possible with the boring bar *A* to work to tolerances of .0005 in. The mounting brackets *C* are hinged to the bar bearing piece and can be adjusted to suit the location of the studs, as shown in Fig. 1. The bar and hand wheel are mounted in the crank case, with the assistance of the alining bushings *B* which fit loosely in the crank-case bearings and can be moved along the bar to suit. A dial indicator *F* is used to center the bar and cutter accurately in the bearing.

After a crank-case bearing has been bored, the mounting bracket and bar bearing are slipped out; the cutter *H* is moved to the next crank-case bearing and the bracket and bar bearing are replaced. The feed nut *G*, like the four bar bearings, is also made in halves hinged together so that the two halves can be opened and moved along the bar. In this manner the feed nut can be easily moved to the opposite end of the feed thread after a cut, while the bar is slipped back.

The boring bar is of cold-rolled steel, 1¾ in. in diameter. The bar-bearing assemblies *C*, Fig. 2, are adjustable vertically and horizontally. The feed nut *G* is held in position by the clamps *E*. As shown in Fig. 1, the lower halves of the crank-case bearings are securely bolted in position previous to the boring operation.

Fig. 3 shows all of the parts of the main-bearing boring assembly. Referring to the lettered designations: *A*, are adjustable mounting brackets and boring-bar bearings; *B*, adjustable fly-cutter head; *C*, boring bar; *D*, feed nut; *E*, locating or alining bushings; *F*, holding clamps for the feed nut *D*, and *G*, hand wheel for operating the boring bar. Parts *H* to *M*, inclusive, are the details of the tool shown in Fig. 4 for cutting the fillets and facing the sides of the connecting-rod bearings.

Referring to Fig. 4, *A* is a facing tool; *B* is a wrench for tightening the mandrel, and *C* is the hand wheel for turning the cutter. The parts of the expansion mandrel are shown in Fig. 3, designated *J*, *K* and *L*.

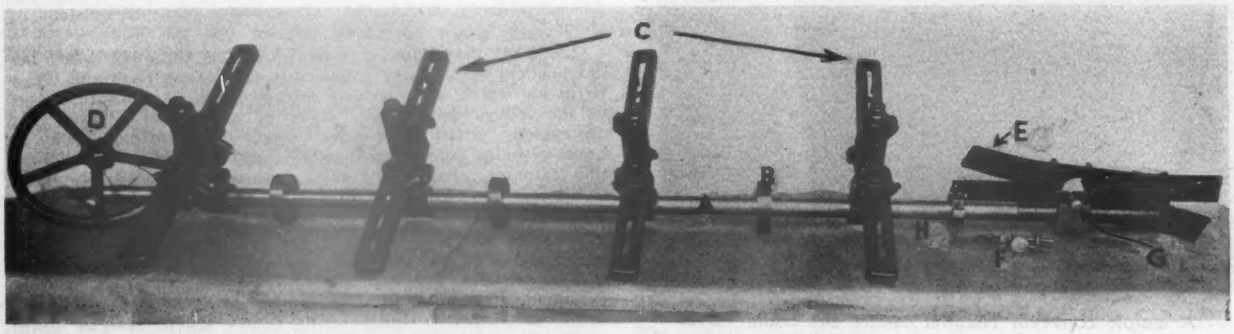


Fig. 2—Boring bar as assembled for operation

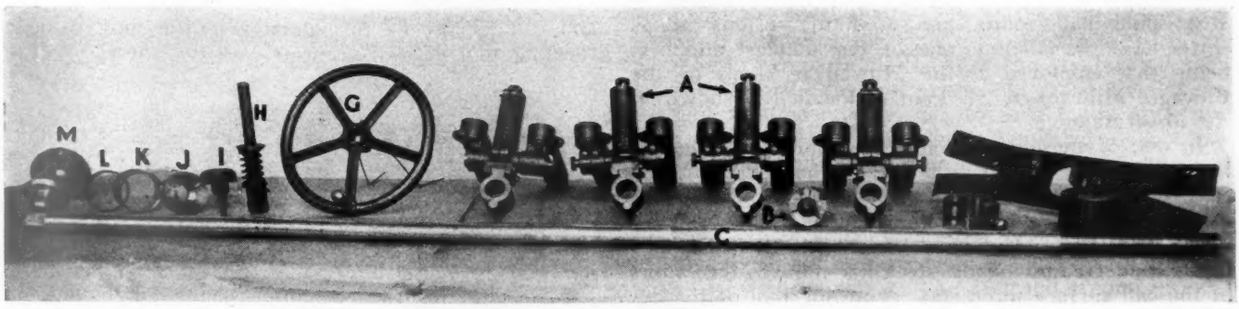


Fig. 3—Details of the boring-bar for crank-shaft bearing seats and the facing and filleting tool for connecting-rod bearings

The details *H* show the turning bar and feed spring, and *M* is the cutter head.

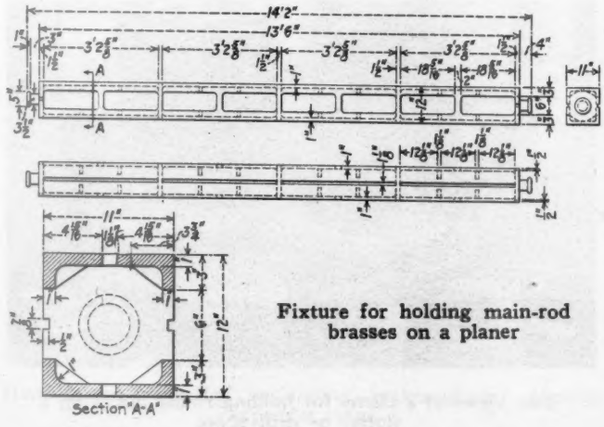
The connecting rod is held in a bench vise. The arbor is expanded in the bearing. The feed springs are

Fig. 4—Facing and filleting tool for connecting-rod bearings

then compressed and the cutter head *M* is secured to the shaft *H* with the wrench *B*, Fig. 4. Thus the cutting tool is held firmly against the cheek at the bearing.

Machining Main-Rod Brasses on a Planer

THE fixture shown in the drawing is used by an eastern road for holding main-rod brasses on a planer. It is made of cast iron and the pattern can be built to any convenient length. Referring to the top view, two keyways are provided—one at each end of the casting. As shown in the end view, these keyways are on the reverse side and are for the purpose of keeping the fixture in alignment on the planer. Either of the two keyed sides can be placed on the planer table.



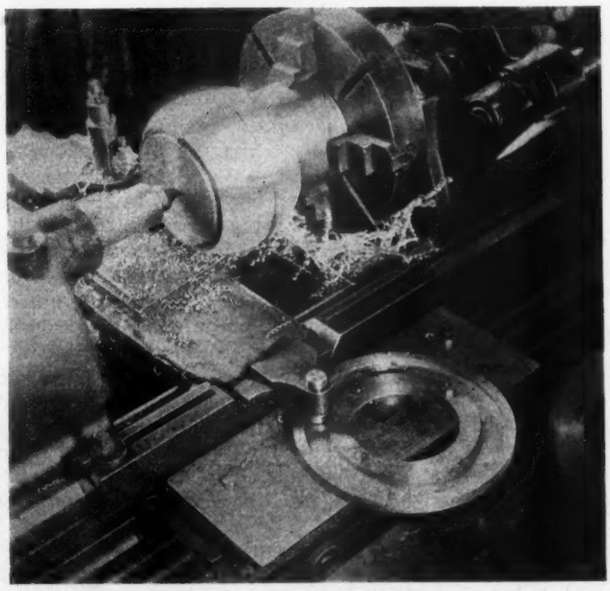
Fixture for holding main-rod brasses on a planer

The fixture is clamped to the table by two or more bolts, which are inserted through the openings shown in the top view. The main-rod brasses are sweated together, with one side faced, and placed on either or both sides of the fixture, depending on the number to be machined simultaneously. The 1⅛-in. slots shown on opposite sides are used for clamping the brasses.

The trunnions at either end of the fixture are provided for the purpose of rotating the jig and brasses to avoid having to loosen and fasten the brasses again to finish another side. This feature also assures the sides being exactly parallel, provided, of course, that the sides of the fixture are parallel.

Machining Large Ball Joints

ONE of the railroad shop operations which requires the most exacting care is the machining of ball joints in the large steam pipes used on articulated locomotives. Both the ball joints on the steel pipes, as



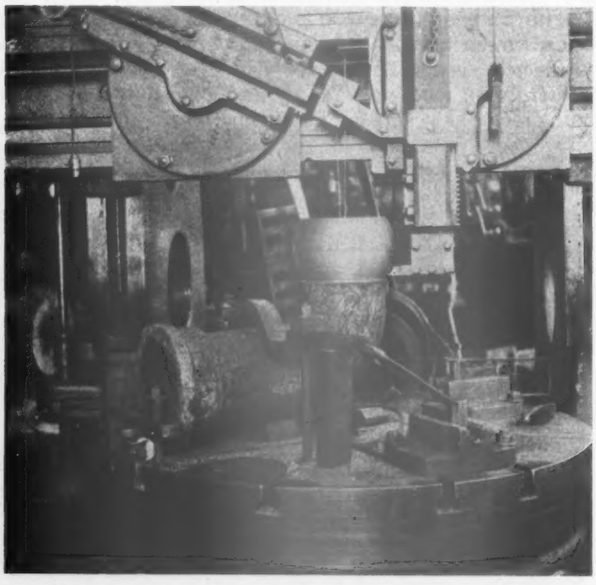
Forming a steam-pipe ball end on an engine lathe

well as the brass packing rings commonly used to make the joints steam tight under the swiveling action when locomotives are rounding a curve, must be machined accurately and smoothly to hold the steam.

A number of satisfactory methods of machining large

steam-pipe ball joints are used in various shops throughout the country, one of the simplest and best being that employed at the Milwaukee shops of the Chicago, Milwaukee, St. Paul & Pacific, as shown in the illustrations.

In one of these views, an ell is shown clamped to the table of the boring mill with the ball end centered over the table center. The left boring mill head is clamped rigidly in the position shown, the cross-feed screw being removed from the right head and the two heads connected by a short steel link equal to the radius of the ball surface to be cut. A cutting tool of the desired shape is set in the tool post, and vertical feed of the right head cuts a spherical surface on the steel pipe.



Machining a steam-pipe ball end on a boring mill

The operation is not quite as easy as it sounds, since the cross feed must be obtained by hand adjustment of the cutting tool so that when the final finishing cut is taken an accurate spherical surface of the required diameter will result. After set-up of the machine, the production time required for this machining operation is approximately 2½ hours for each steel ball end.

A somewhat similar method is used in the case of the ball joint shown in the second illustration. This steel ball is threaded and screwed onto a special mandrel, chucked in an engine lathe with the outer end rigidly supported by a circular plate and the tail centered.

A circular plate provided with a groove of the same center line diameter as the ball to be turned, is secured to the taper attachment of the lathe by means of three cap screws. With the cross-feed screw removed from the tool slide and a roller fitting in the groove, longitudinal feed of the carriage will cause the cutting tool to cut a ball surface.

As mentioned, the machining operation is one requiring more than ordinary care and a witness mark is usually carried at the center of the ball until the surface has been roughed out and calipered to assure that the correct shape is being attained. A final finishing cut then removes the witness mark and gives a smooth, accurate ball surface.

The machining of the brass packing rings does not occasion so much difficulty, inasmuch as the rings have a relatively narrow bearing surface on the steel balls and can usually be turned on a boring mill, using a forming tool ground accurately to the correct radius.

A Quick-Acting Clamp for a Slotter

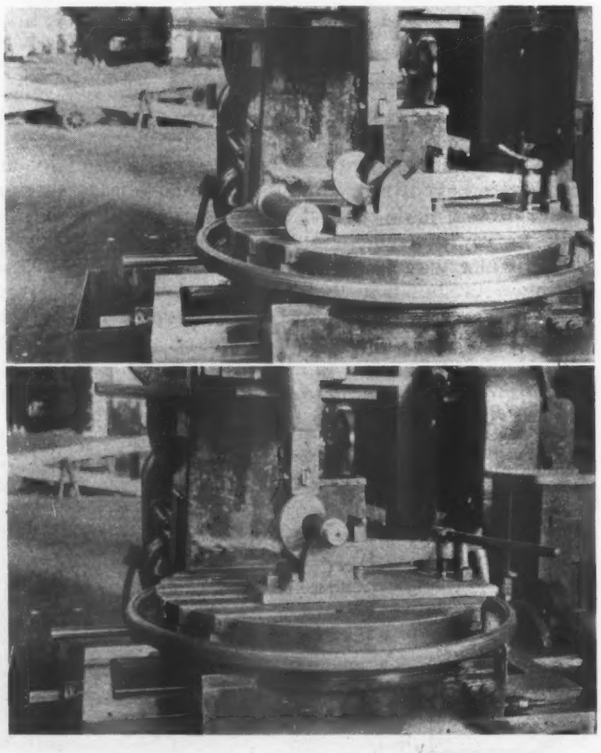
By H. W. Payne

SHOWN in the illustration is a quick-acting clamp designed to hold locomotive spring-hanger pins on a slotter when cutting the notch on the head. The clamp can also be used for other purposes, such as holding pins or studs on a drill press for drilling cotter-pin holes, etc.

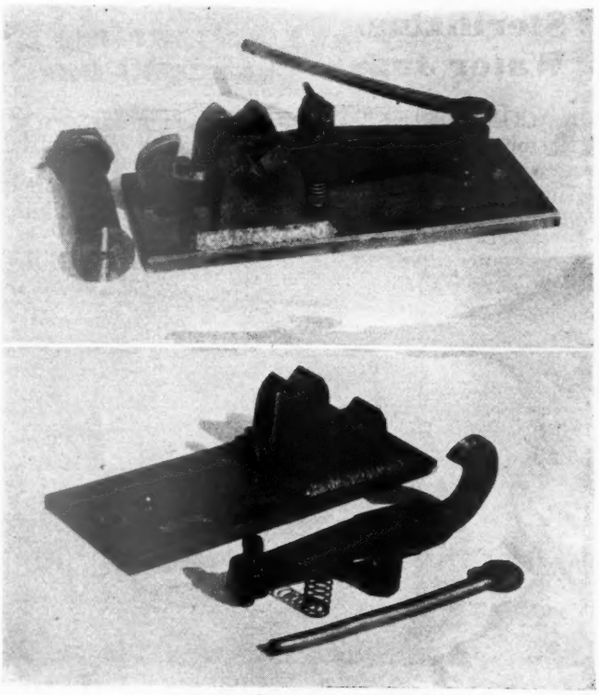
It consists of two V-blocks electrically welded to a base plate, a lever with a hinged hook on one end, and a cup-pointed set screw on the other. A stud, which serves as a fulcrum for the lever, is set vertically in the base plate. At this fulcrum point the lever rests on a coil spring around the stud which holds the lever up against the nut on the stud. The hole in the lever for the fulcrum stud is sufficiently large to permit free angular movement of the lever in a vertical plane. A short piece of round bar iron is welded across the top of the fulcrum-stud nut and serves the same purpose as a wing nut. The set screw seats on a ¾-in. steel ball which is electrically welded to the base plate. A socket wrench is provided for adjusting the set screw.

The hook and lever are adjusted to the diameter of the work by turning the fulcrum-stud nut up or down as required and adjusting the set screw to suit. The set screw forces the lever up, which causes the hook to bear against the work, clamping it securely in the V-blocks.

When the proper adjustments are made to suit the diameter of the work, a half turn of the set screw will



Two views of a clamp for holding round pieces on a slotter or drill press



Top: Clamp assembled—Bottom: Detail parts of the clamp

clamp or release the work. The fulcrum-stud spring permits a quick release of the hook when the pressure is released at the end of the lever. No further adjustments are required for additional pins after the clamp has once been adjusted.

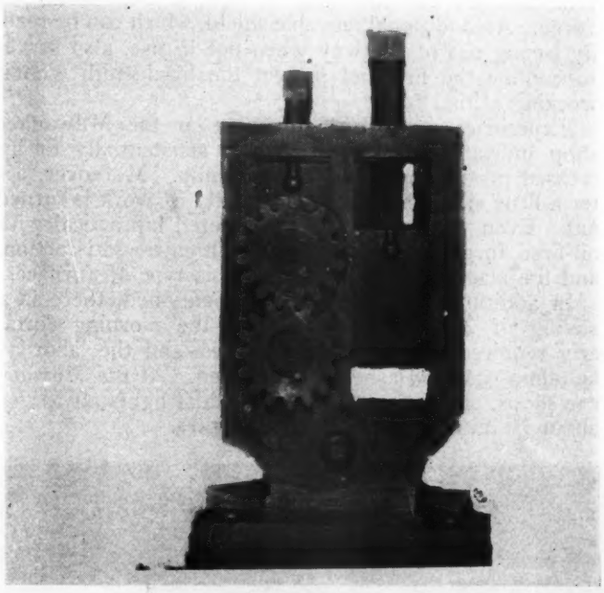
Reconditioning Expander Rings

By R. T. Skinner

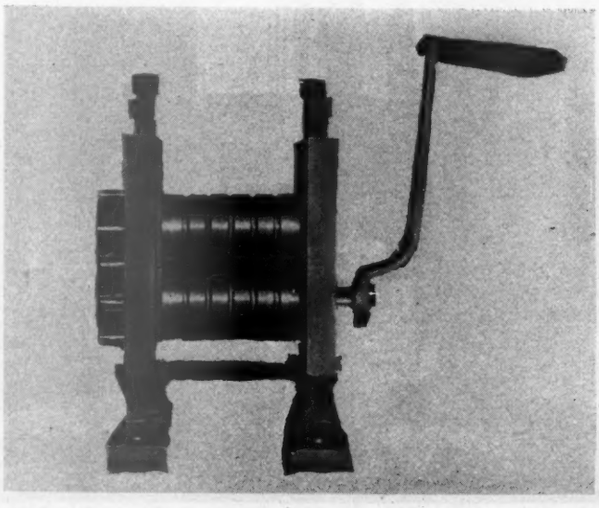
A LARGE number of brake-cylinder packing expanders, or expander rings, for use in locomotive and car brake cylinders, become distorted in service or subsequent handling and require reconditioning before they are used again. The method sometimes followed of annealing the expanders, truing them on the anvil and retempering is too slow and involves so much labor as to make the cost practically prohibitive. Moreover, it is almost impossible to turn out a true ring with just the desired amount of opening at the ends and resultant uniform spring pressure against the packing.

To overcome these difficulties, a small and simple set of hand-driven rolls, illustrated, was designed, made of tool steel and grooved to accommodate different sizes of expander rings. The first and second grooves from the left take care of 8-in. and 10-in. rings used in car-brake cylinders. The center groove accommodates 12-in. and 14-in. rings, used in locomotive brake cylinders, and the large groove on the right accommodates 16-in. and 18-in. expander rings, used in Pullman passenger-car brake cylinders. As many as 270 10-in. rings and 255 8-in. rings have been reclaimed in one day at a central reclamation point to which quantities of expander rings are shipped, and the net saving is at least 50 per cent of the cost of new rings.

The construction of the packing-ring expander rolls is shown in the illustrations. The lower grooved roll,



End view of packing expander rolls showing adjusting screws for the upper grooved roll and the idler roll



Hand-driven rolls for reclaiming brake-cylinder packing expander rings

revolved by a handle, drives the upper roll, correspondingly grooved to grip the ring, by means of two small spur gears better shown in the end view. A plain idler roll in the rear serves to give the required curvature to the ring as it is passed through the device. All rolls are capable of adjustment to give the desired results in reclaiming the rings by means of set screws. A checking block may be used to make sure that the rings conform to standard dimensions and have the required opening.

THE PUBLIC HEALTH DEPARTMENT of the Province of Ontario has recently received a completely equipped dental car, for use in the northern part of the province. The car, loaned to the Ontario government by the Canadian Pacific, was converted, at the railroad's Angus shops, from a sleeper into a dental laboratory, with living accommodations for a doctor and nurse. It will be maintained by the government, and will have free running rights over all northern Ontario railways.

Oil-Fired Forges

WHILE considerable sentiment no doubt attaches to the old type of coal-fired forge used for so many years in railway blacksmith shops, there can be no question about the advantages of modern oil-fired forges, from the point of view of cleanliness and production in territory where the necessary fuel oil can be secured at reasonable rates.

The illustration shows an installation of modern oil-fired blacksmith forges at the Milwaukee shops of the Chicago, Milwaukee, St. Paul & Pacific. The forges are of the round, side-fired type, equipped with Johnston burners and air under pressure from the shop blower line. There are about 20 of these forges in the blacksmith shop which, together with all other furnace equipment in the shop, are oil-fired.

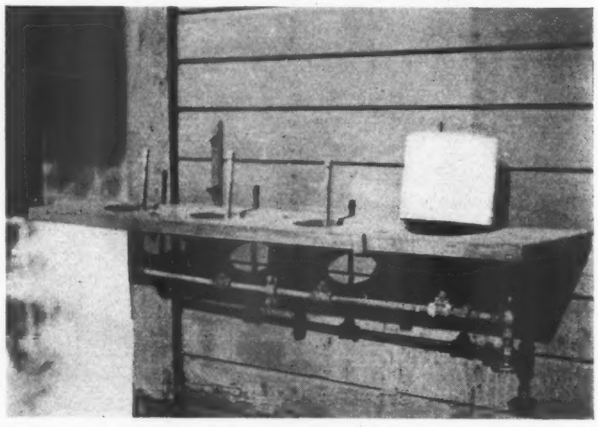
Referring to the illustration, the general construction of the forges will be evident. An arch is built of firebrick over the fire and just high enough to enclose the steel bar or part to be heated. A large fixed sheet-iron shield serves the double purpose of keeping drafts away from the fire and confining the heat to each individual forge. An additional movable shield, which can be readily swung out of the way when not in use, also serves to confine the fire and protect the blacksmith who is working at that forge.

Experience with this equipment at the Milwaukee shop indicates that it contributes substantially to increased production and a cleaner shop. Moreover, after a little experience, a better quality of work is turned out. Even welding, at first considered inpractical with oil-fired forges, is now handled with entire satisfaction, and the blacksmith force prefers this type of furnace.

In addition to the advantages mentioned, there is a saving of 20 min. shop time in the morning formerly required for kindling coal fires, and the labor of handling coal and ashes is also saved. At the Milwaukee shops, one man on the second shift lights all forges about 10 min. before the whistle blows.

Sterilizing Water Jugs

A CONVENIENT and sanitary arrangement for the sterilization of trainmen's and enginemen's water jugs is shown in the enclosed illustration. A ⅜-in. pipe leading from the radiator line in the supply room to a shelf attached to the outside of the building



Steam pipes projecting up through the shelf provide a handy method for sterilizing water jugs

will furnish sufficient steam to sterilize the jugs.

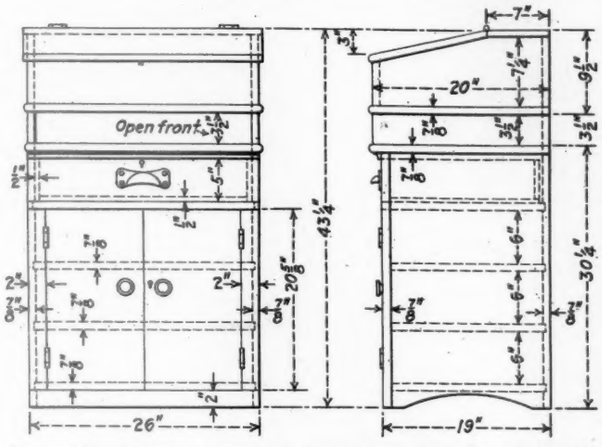
The capacity of the shelf and the number of exhaust nozzles needed depends on the number of water jugs handled; however for a terminal despatching from 75 to 100 engine crews daily, the four-connection arrangement as shown is ample.

Before being sterilized the water jugs are thoroughly washed on the exterior with soap and water and the last sterilizing date is removed from the bottom of the jug. After jugs are removed from the sterilization rack, they are again stencilled so as to indicate to the engine crew that they are sanitary.

Oil-fired blacksmith forges at the Milwaukee shops of the C. M. St. P. & P.

Combination Tool Box And Cupboard

THE combination tool box and cupboard shown in the drawing is one of the standard facilities used in the back shops and engine terminals of an eastern

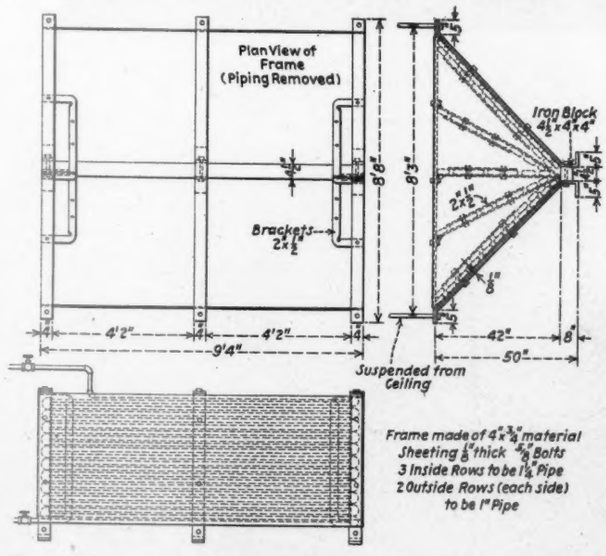


A combination tool box and cupboard for machine operators

railroad. It is made of poplar and is 43¼ in. high by 26 in. wide. A depth of 19 in. affords commodious shelf and cupboard room.

Dryer for Locomotive Sand

SHOWN in the drawing is a hopper and steam-coil arrangement designed to dry sand for locomotives. The hopper is made of ⅛-in. sheet steel and is suspended from the ceiling or roof structure by six ⅝-in. rods or bolts. The frame for the hopper is made of 4-in.

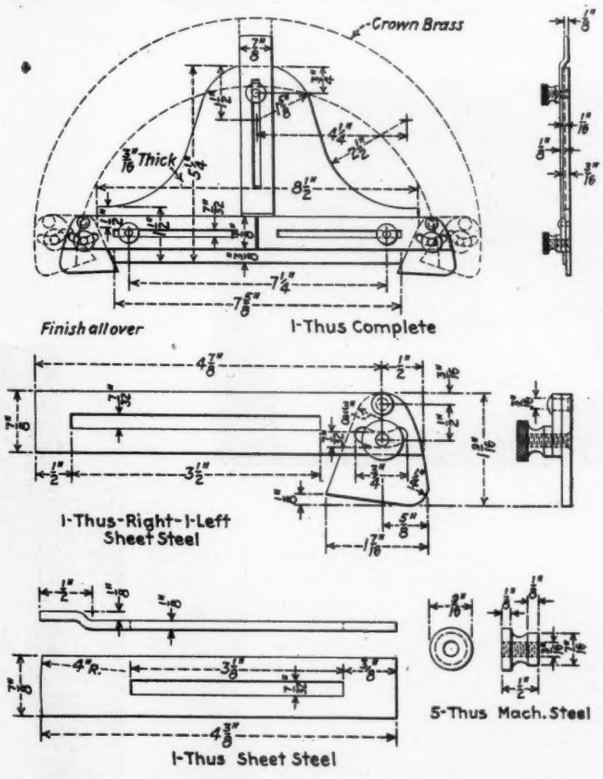


Overhead hopper and steam-coil arrangement for drying sand

by ¾-in. bar iron. The heating coils are arranged in five sections. The three inside sections are of 1¼-in. pipe and have a single row of pipe coils. The two outside sections are of the same size pipe but have a double rows of pipe coils.

Fitting Crown Brasses To Driving Boxes

THE adjustable gage shown in the drawing is designed for transferring the measurements taken from the inside of a driving box to the edge of the crown brass which is to be fitted to the box. When in use the thumb screws of the gage are loosened, the vertical arm of the gage is set against the top of the box on the center line, and the horizontal arms are set to



Adjustable gage for laying off the edge of crown brasses when fitting to driving boxes

locate the lower sides of the crown brass. The gage setting to mark the outside edge of the crown brass is indicated on the drawing by dotted lines. The thumb screws are tightened when the three adjustable arms have been set to the box and the gage is then applied to the edge of the crown brass for laying off.

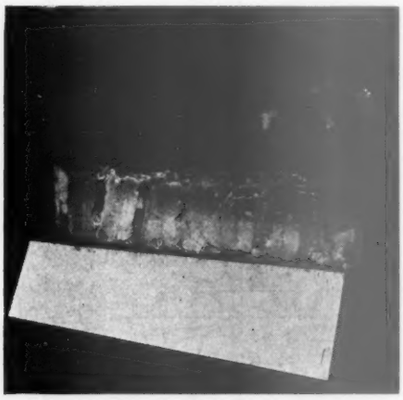
The gage is made of ⅛-in. and $\frac{3}{16}$-in. sheet steel.

A MECHANICAL OFFICER'S HOBBY.—The hobby pursued by Henry B. Bowen, chief of motive power and rolling stock of the Canadian Pacific, during his spare hours is not far removed from his every day work, in that hobby and life work both deal with machines. But in another sense the two are far apart, for the hand that runs machine shops by scratching a pen in the day time itches for the control of a lathe after working hours. In the basement of his home in Montreal Mr. Bowen has what is considered to be the most complete private machine shop in that city. Here he spends hours of leisure time, and his principal product is model stationary and marine engines. And his marine engines have been put to practical use. His three sons operate a fleet of five model steamboats on Echo Lake in the Laurentian mountains, Mr. Bowen's summer home. The latest product of the Bowen shop is a 4,000-r.p.m. marine engine which is only 4 in. in height. One of the devices in the shop is a milling machine which Mr. Bowen designed and built. In this shop have also been evolved a number of tools which are in regular use in the railway's shops.

NEW DEVICES

Conditioning the Air In Passenger Coaches with Ice

The R. B. Engineering Corporation, 11 West Forty-Second street, New York, in co-operation with the mechanical department of the Boston & Maine, has developed a system for conditioning the air in passenger cars by the use of ice as a cooling medium. This development was sponsored by the Metropolitan Ice Company, Boston, Mass., and the installation was made by the Boston & Maine. The system consists essentially of two ice bunkers, two blower fans, a circulating pump, two dirt and dust filters, and four coolers of the automobile radiator type.



Bunker charged with ice

The source of refrigeration is ice, the ice being carried in bunkers beneath the car. Water which is cooled by being sprayed over this ice is circulated by pumps through concealed fin-tube radiator-type coolers at either end of the car. Air, cooled by passing through these cooler units, is then drawn across the car ceiling from end to end, thus lowering the temperature gradually and without draft. The air is automatically dehumidified at the cooling surfaces and is separately filtered. It is kept under slight positive air pressure, which prevents outside dirt and dust from entering.

The air-circulation system maintains rapid circulation over the heads of the occupants, such that the resulting static pressure and relative air densities allow cold air to pass down as it will from the main stream. All air circulated is refrigerated.

The air is discharged into the passenger compartment at high velocity from one opening (the lower one in the illustration). The air circulates the full length of the car to a return-air opening, which is located in the partition at the opposite end. The location of the discharge and return air openings are reversed with respect to the locations in either end so that the discharge outlets are in direct line with the return-air openings. With fans operating at both ends of the car, the air streams flow in opposite directions on the two sides of the car. The relative paths of air travel are maintained by a blowing, as well as a suction action. If one blower stops, or if the speed is lowered, the scheme of air circulation fails to function. But with the system functioning as it is designed to operate, conditioned air is circulated without draft at the level of the passengers' heads, in all parts of the car. Anemometer readings showed clearly that two distinct, ductless streams are flowing, with the same velocity but in opposite directions:

The schedule of equipment follows:

1 standard 450-amp.-hr. battery
1 standard 5-kw. generator
2 insulated ice tanks, 800 lb. ice capacity each
1 Gould centrifugal pump with ¾-hp. motor
2 "Protectomotor" dry-felt air filters, 45 sq. ft. each.
2 Sturtevant blowers, Type 0, 140 c.f.m., ¼ in., with ½-hp. motor
4 McCord radiators, 24 in. by 18 in. by 3.25 in., 160 sq. ft. each, all copper

In operation the air circulation system is "wide open." There are no automatic controls and no dampers. The amount of outside air depends entirely on the pressure in the car, which is always positive. The slight pressure keeps air circulating out through window and door

Boston & Maine coach No. 4530 equipped for conditioning air with ice

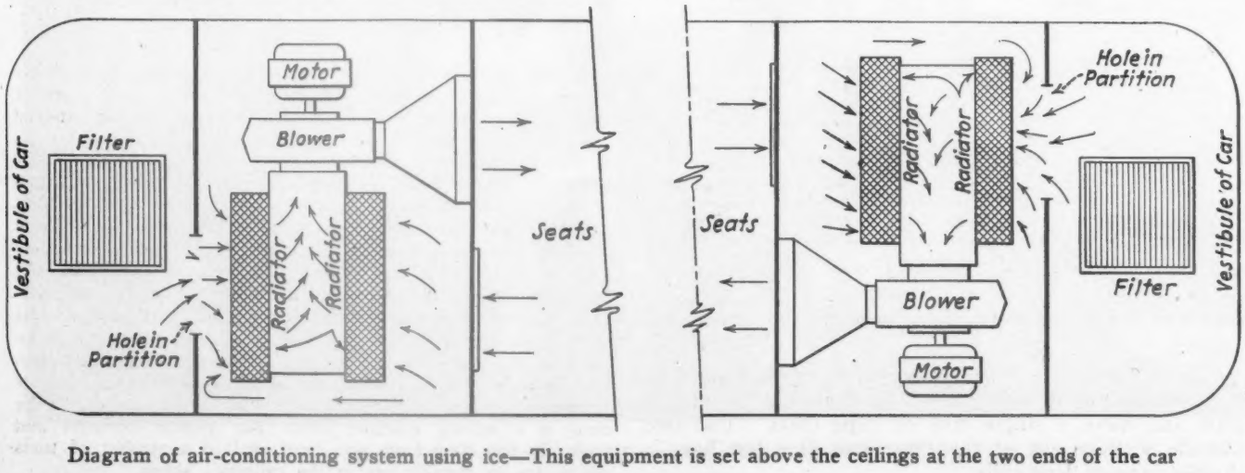
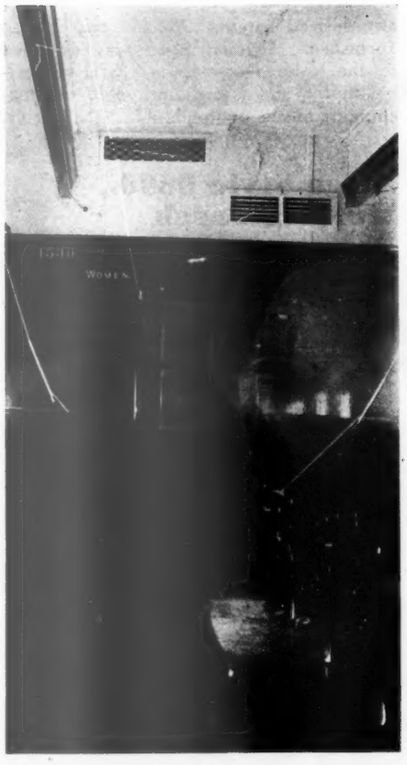


Diagram of air-conditioning system using ice—This equipment is set above the ceilings at the two ends of the car



Cool air is discharged through the lower opening while the opening near the ceiling is the return-air intake—This arrangement is reversed at the opposite end of the car

crevices and eliminates dust and smoke infiltrations.

The battery, generator and ice bunkers are located underneath the car. The centrifugal pumps, blowers and remaining equipment are located above the two vestibules, as shown in the diagram of the water-cooling system.

Robert T. Brizzolara, president of the R. B. Engineering Corporation, reports the following relative to a test run made with the experimental car: "The maximum amount of fresh air drawn in at any time was about 20 per cent. Some mild churning of air between the two opposite streams could be observed in the center of the car above the level of the heads, but it was not of consequence.

"The filters were made of aluminum grids covered with a large area of special felt. The cleansing effect of the radiators was evident from the clear air in the car with several men smoking. With 60 passengers the same results were noted.

"There was no car precooling or any preliminary attention whatever, and the system was not started until the train was under way. The results were not obtained in anticipation of publication nor as an ideal demonstration, as the attendants experimented with louvres, fan speeds and water flow to the degree that the temperatures are not especially uniform. Neither were they as high as the public required for comfort. However, we found it quite practicable to have a controlless car after a fixed setting of all equipment is made. Its satisfactory performance will be improved by the installation of a thermostatic control on the ice-water supply line. We ran temperatures that were 10 to 16 deg. F. lower than those that prevailed outside and 14 to 19 deg. F. lower than those in other cars of the same train. The humidities were quite within those ordinarily required in conditioning work of any sort.

"Runs between Boston and Portland, Me., have been made with 60 passengers in the car, maintaining 16 deg. F. lower temperatures than outdoors. The ice consumption averaged 600 lb. of ice per hour, a refrigerating rate of 7.5 tons."

Two of the tables give logs of observed data, including the ice and power requirements for a five- to six-hour run on a cool day and a warm day.

Carbide Tips On Cutting Tools

A new method of applying carbide tips to cutting tools has been developed recently by the Ramet Corporation of America, North Chicago, Ill., and is now being used in many of the tantalum-carbide tools manufactured by this company and its licensees.

An insert of pure molybdenum is brazed between the steel shank and the tantalum-carbide tip. Molybdenum inserts, having almost the same coefficient of expansion as the tantalum-carbide alloy, effectively prevent strains being set up or cracks developing in the cutting tips as the tools cool after the brazing operation. Such strains as may develop between the molybdenum insert and the steel shank are entirely absorbed by the molybdenum, due to its great ductility.

Inserts of molybdenum are especially desirable in tools where the carbide tips are long, thin, or of unusual shape; or where unusually severe conditions of operation are expected.

Lunkenheimer "Glaswick" Oil Cup

A wick oil cup is being marketed by The Lunkenheimer Company, Cincinnati, Ohio, which provides automatic lubrication, visibility of oil supply, maintenance of constant oil level with consequent uniform feed, and ease in replenishing the oil supply. The "Glaswick" oil cup has a capacity of approximately four ounces of oil. It consists of a steel cup with a shut-off cock in the shank, and a glass bottle which fits over the top of the cup. The bottle is held securely to the cup by

A wick oil cup with a glass reservoir and a shut-off cock

means of a steel wire and clamp. Tight closure between glass bottle and steel cup excludes dirt.

When placed in service, the steel cup is filled with oil. The glass bottle is also filled and placed in an inverted position over the steel cup. Visible presence of oil in the glass bottle is assurance that the steel cup is full and that the wick is absorbing sufficient oil to insure a constant uniform feed to the bearing. The desired rate of feed is obtained by determining the number of strands of wick to be used, and the oil then feeds at a uniform rate; the cup needs no further adjustment. When replenishing the oil

Observed Test Data on Boston & Maine Coach No. 4530, Sept. 9, 1931 Sept. 10, 1931

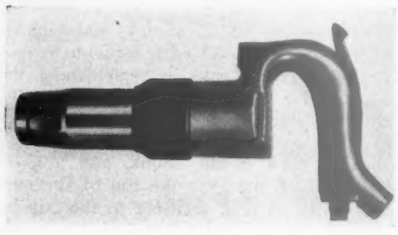
	Sept. 9, 1931					Sept., 10, 1931				
	A.M.	A.M.	M.	P.M.	P.M.	A.M.	A.M.	M.	P.M.	P.M.
Time	10.00	11.00	12.00	1.00	2.00	10.00	11.00	12.00	1.00	2.00
Train started 9.30; cooler at 9.47 A. M.						Train and cooler started at 9.00 A.M.				
Outside, wet bulb	65	66	72	76	75	72	75	75	76	77
dry bulb	77	80	82	80	85	80	85	85	90	92
Other car, d.b.	68–70	70–72	72–85	75–80	75–83	82	87	91	92	98
Center test car, w.b.	57	59	62	62	63	60	60	67	64	65
(7 ft. 6 in. up) d.b.	65	67	71	72	73	71	71	78	76	78
Front conditioner, air entering car, w.b.	48	48	55	56	57	57	60	56	55	57
Front conditioner, air entering car, d.b.	52	52	60	60	60	60	63	60	58	60
Front conditioner, air entering cooler, w.b.	58	63	64	65	66	64	65	68	66	67
Front conditioner, air entering cooler, d.b.	63	75	74	76	76	73	74	78	79	79
(Rear conditioner gave closely similar results both days.)										
Level of passengers' head, d.b.										
Left front	70	70	74	76	77	73	73	80	78	80
Left center	67	66	70	73	71	71	71	78	76	78
Left rear	70	70	74	76	77	73	74	80	80	80
Other side closely similar										
Total amp. used	44	47	..	49	55	Ice consumption = 418 lb. per hr.				
Volts	29	30	..	31	30					
Ice consumption = 290 lb. per hr.										

supply a number of spare bottles can be filled in the oil room, carried in a basket or box to the bearings and the empties replaced with full bottles.

The cock in the shank permits shutting off the flow when the bearings are idle, making it unnecessary to remove the wicks to stop the feed. This shut-off feature also conserves the oil supply when machinery is not running. Further, it provides an accumulation of oil to flush the bearing when the cock is opened. After the accumulated oil runs out, the "Glaswick" feeds at the predetermined rate.

Chipping and Riveting Hammers

The Buckeye Portable Tool Company, Dayton, Ohio, has just placed on the market a pneumatic high-speed chipping and light riveting hammer, of which the one-diameter piston is the only moving part. The piston is self-controlled. There are



Hercules high-speed chipping and riveting hammer

no valves or flapper plates, the piston itself performing both the function of a piston and a valve at the same time. The piston in this hammer is balanced, eliminating friction from the cylinder walls. Vibration and recoil have been reduced to a minimum and the hammer throttles down for light blows without jumping or stopping. The hammer has only three major parts—the handle, the cylinder and the piston.

Elwell-Parker Elevator Chisel Truck

The Elwell-Parker Electric Company Cleveland, Ohio, has placed on the market a 6,000-lb. fork-type electric truck

Elwell-Parker electric truck of 6,000 lb. capacity

which is built to accommodate either a battery or gas-electric unit for power purposes. The truck is driven by motor through worm and gear. The drive wheels are 22 in. in diameter. The power plant is supported at three points to accommodate it to uneven runways, shop yards and platforms.

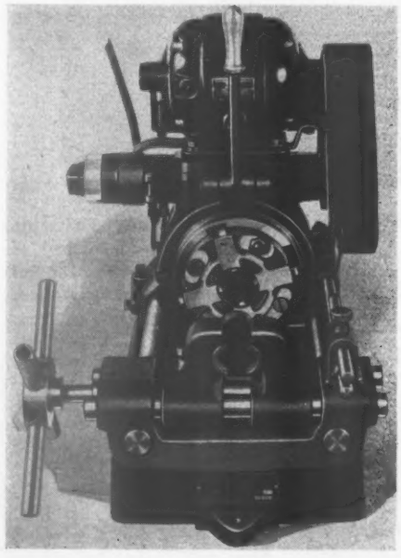
The forks are made in various lengths and with varying spreads to accommodate different types of loads such as sheets, boxed machinery or loaded skids. After the forks are thrust under the load it may be tilted back 30 deg. to facilitate safe carrying to destination where the load may then be elevated for tiering if desired.

Both the tilt and hoist features are accomplished by one unit. The lift is by cable while the positive tilt is by rack and pinion drive. Likewise the rack type provides for a positive forward tilt of uprights of several degrees. Automatic limit switches are used throughout in the operation of the truck.

"Tom Thumb" Machine With Rotary Die Head

As a companion to the original Tom Thumb pipe and bolt machine, which was placed on the market last year, the Oster Manufacturing Company and Williams Tool Corporation, Cleveland, Ohio, have just brought out the new rotary-die-head Tom Thumb.

The regular pipe capacity of the new machine includes all sizes from ½ to 1¼



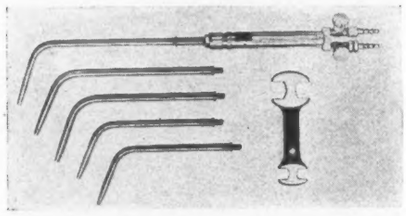
The Oster pipe machine showing the adjustable quick-opening die head and the use of nipple jaws

in. with an extra capacity down to and including ⅛ in. The regular bolt capacity is ⅜ in. to 1¼ in. with an extra capacity of ¼ in., 5/16 in., 1⅜ in. and 1½ in. It can be furnished either as a bolt threader or with special equipment to handle nipples.

The machine is equipped with a stock-stop and an automatic trip which opens the die head when the thread has reached any desired length. A hand trip is also furnished. Driving power is furnished by the ½-hp. Domestic universal reversible motor and is transmitted to the machine by means of the double V-belt drive.

Airco Style 9800 Welding Torch

The Air Reduction Sales Company, New York, has recently placed on the market a new welding torch known as



Airco-Davis-Bournonville Style 9800 welding torch with long flame characteristic

Style 9800. Among the new features embodied in this torch are a ribbed handle, new type mixing-head nut, oxygen and acetylene ball-seat type needle valves and an improved method of repacking the needle valves.

The ribbed handle affords a positive gripping surface without harshness to the hand. A skirt has been added to the hexagonal nut on the mixed head, allowing it to be loosened or tightened by hand and eliminating the necessity of using a wrench. The ball-seat type needle valve has been adopted for this torch after extensive trials. The principal feature of the Airco needle valve is a ball seat of stainless steel.

Among the characteristics of the Style 9800 torch is that of a soft flame which is accomplished by reversing the conventional methods of bringing gases to the tip. In this torch the oxygen enters the torch head at the side and the acetylene through the center. Tips of pure hard-drawn copper of either the swagged or the separable type may be used with this torch. Both types of tips are made to furnish the bulbous or the long pointed flame.

Tools Tipped with Tungsten Carbide

The O. K. Tool Company, Shelton, Conn., has developed a line of cutter blades and tool bits tipped with tungsten carbide which are interchangeable with any of the standard cutters now manufactured by that company. These tools are made in a wide range of shapes and sizes to be used in milling cutters, boring and facing tools and single tool holders. The O. K. face mills with tungsten carbide blades are made in diameters from 4 in. to 14 in., while the end mills range in diameter from 1½ in. to 7 in.

(Turn to next left-hand page)

Locomotive Wheel Scales For Checking Rail Loadings

Fairbanks, Morse & Company, 900 South Wabash avenue, Chicago, has installed locomotive wheel scales in the North Billerica, Mass., shops of the Boston & Maine for checking rail loadings and to determine whether or not alterations made to locomotives since being weighed by the builders have changed the distribution of weight over the driving wheels and, perhaps, overloaded certain springs.

The scales are composed of six units, each of which serves one pair of wheels. The units are placed in a concrete pit in the erecting shop, accessible to the traveling cranes used handling locomotives. The load-bearing member of each scale is a section of 100-lb. rail 30 in. long. This length enables the units to be so located that they accommodate a majority of the locomotives without change. The units have to be shifted to provide for the other engines. The shop foreman is furnished a diagram which enables him to relocate the units to suit the wheel spacing required by the

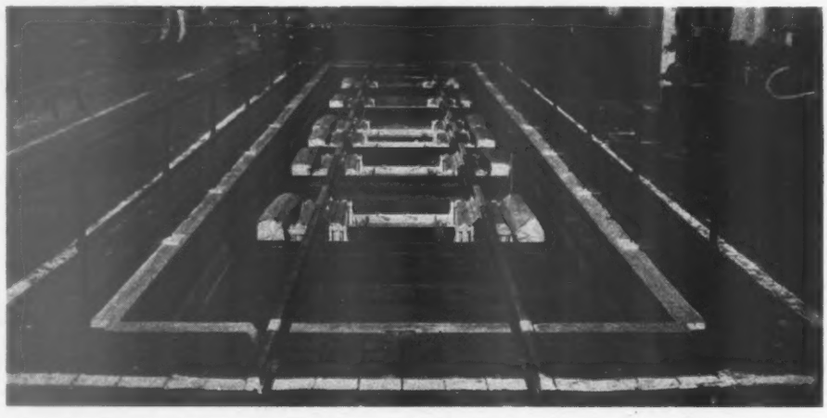
One unit of the wheel-load scales

locomotive to be weighed. An assortment of rails of odd lengths are kept on hand to serve as fixed rails to connect the scale rails.

The scales, two of which with their frame constitute a unit, are of 40,000-lb. capacity each, tested to an accuracy of 25 lb. At the ends of each load-bearing member is a post which serves both as a support for one of the main levers and for the adjacent fixed rail, insuring the proper relation between the fixed and the scale rails. The weigh beams, which are of the screw type, are located 18 in. outside the center of the rail and at about the height of its base. The poise has a run of 20 in., with a lead of ½ in., on a triple thread. All parts exposed to water dripping from the engines are of aluminum or are nickel-plated. When not in use, the weighing beams are covered by removable hoods for protection.

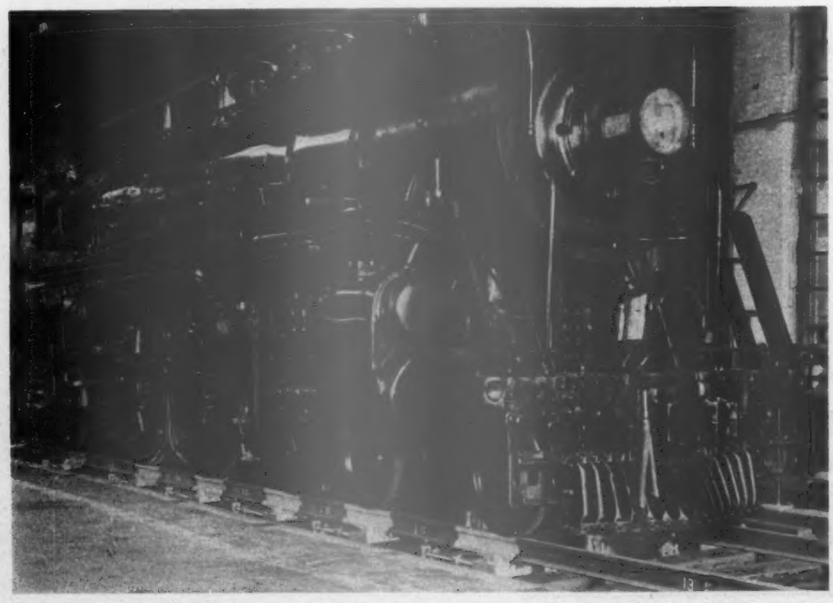
The two scales forming a unit are installed on a rectangular, structural-steel frame about 8 ft. long, which extends across the pit. The frame is provided with clevices for convenience in handling the unit with the crane.

A pit 50 ft. long, 10 ft. wide and 16¾ in. deep is provided for this apparatus, the length being sufficient for an additional unit if desired later. In the center of the pit is a longitudinal trench 20 in. deep, running the entire length and communicating with a drain pipe at one end. The thickness of the concrete under the pit on each side of the trench is 3 ft. and under the trench, 20 in. The concrete work, which is reinforced with rods, rests on 34 piles. The floor of the pit on which the units are placed consists of boiler plate.



Set of six units of two Fairbanks locomotive wheel-load scales installed in the North Billerica shops of the Boston & Maine—The distance between the units can be adjusted to suit different types of power and rolling stock

Individual wheel scales of this arrangement can be used for dining, business, automotive and other special cars which are often heavier on one side than on the other. The scales also provide means for a correct determination of the weight distribution over the springs. In one instance it was desirable to investigate the effect of the rigidity of a car body with respect to weight distribution when the car passes over track in which there is a wind, or warp, as occurs when entering a curve on which the outer rail is elevated. By jacking one corner of the car while the truck at the opposite end stood on the scales this information was satisfactorily obtained. Locomotive tanks can be conveniently calibrated by scales of this design.



A 4-6-2 type locomotive in position for weighing

The Landis Victor Valve-Seat Tap

The Landis Machine Company, Inc., Waynesboro, Pa., has developed and placed on the market a unique tap for tapping the valve-seat ring threads in gate valves. These threads have been a source of trouble to the manufacturers of this type of valve because of the fact that the major diameters of the threads are greater than the port openings. The Victor valve-seat tap is fitted with double-ended chasers, one end for each of the two valve-seat ring threads. Its construction is such that the chasers, when collapsed will clear the port openings.

The chasers are expanded to the cutting position by means of a handle pro-

(Turn to next left-hand page)

Look Critically At Your Older Locomotives

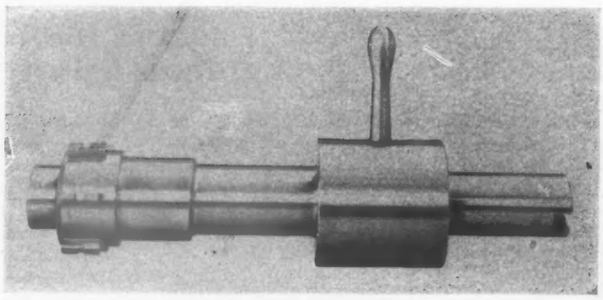
COURAGE in retiring obsolete equipment is one of the qualities required of progressive management.

Many a 10 year old locomotive has lost its usefulness because new designs embody more profit-making possibilities.

The older locomotives may be in good mechanical condition; they may be only a few years old. But, if they fail to measure up to the performance of the modern Super-Power Locomotive, they are money wasters, exacting a continuing excess charge on the production of transportation—**they are obsolete.**

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS • Incorporated • LIMA • OHIO



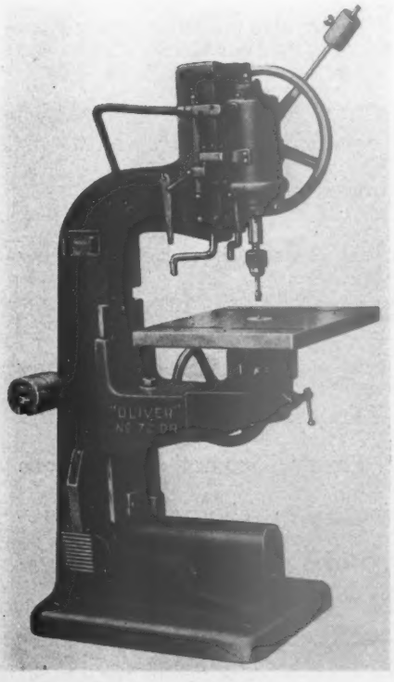
The Victor valve-seat tap fitted with double-end chasers

vided for that purpose after the tap has entered the valve body through one of the port openings. The two threads are tapped with the same chasers in one chucking. The tap is suitable for valves with either parallel or angle seats. Valves with angle seats require a fixture of the trunnion type with stops for bringing the valve-seat ring openings in line with the tap.

Oliver Router For Pattern Makers

The Oliver Machinery Company, Grand Rapids, Mich., has recently developed a router and borer for pattern shop use. This machine, known as the No. 72-DR, will bore holes up to 2 in. in diameter in any depth up to and including 6 in. in the center of 36-in. stock. The table is adjustable 12 in. in a vertical direction, also swivels in a complete circle and can be tilted 35 deg. in all directions. The spindle has a maximum stroke of 6½ in. The size of the table is 20 in. by 24 in. and it is machined on the top and four sides.

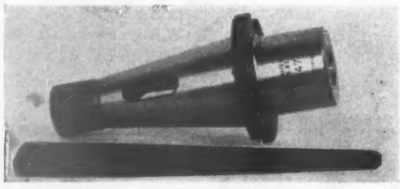
The machine is driven by a 3,600-r.p.m. ball-bearing enclosed motor built into the head and a blower fan with blower pipe leading to the work helps cool the motor and tools as well as to blow the chips away from work.



The Oliver router for pattern-shop use

B. & S. Cutter Adapters

The Brown & Sharpe Manufacturing Company, Providence, R. I., has recently announced new cutter adapters for use with milling machines having a standardized spindle end with No. 40 taper, to accommodate end mills, collets, etc., having No. 3 Morse and No. 7 and No. 9



A Brown & Sharpe cutter adapter for standardized milling-machine taper end

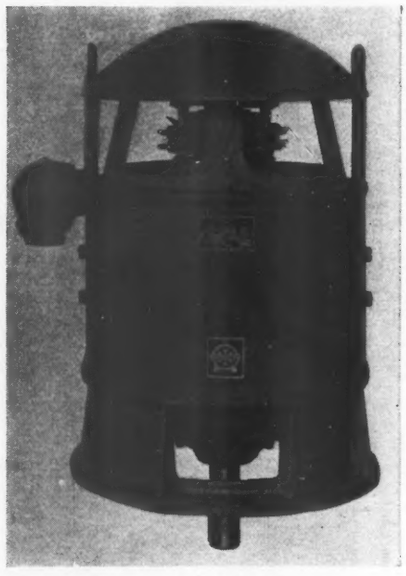
Brown & Sharpe taper shanks. While at the present time there are few milling machines with No. 40 milling-machine standard taper ends, these adapters anticipate present plans of machine-tool manufacturers to incorporate this taper in machines of small sizes.

These adapters will find a wide range of usefulness among users of milling machines having the standardized spindle end, who may wish to use end mills, collets and other tools having the Morse and Brown & Sharpe tapers mentioned above.

Direct-Current Vertical Motors

The Reliance Electric & Engineering Company, Cleveland, Ohio, has developed a line of direct-current motors for vertical operation in sizes up to 50 hp., 1,150 r.p.m. These motors are provided with a ring base for mounting and a drip cover to protect them from falling dirt and chips and from dripping water, oil or other injurious solutions.

Where it is desirable, the motor can be mounted directly on the machine being driven without the ring base and appear as an integral part of the machine. Amply large bearings are used to take up the thrust load or weight of the armature. Two heavy eye-bolts are provided to make handling easy. In all other ways the construction is the same as the

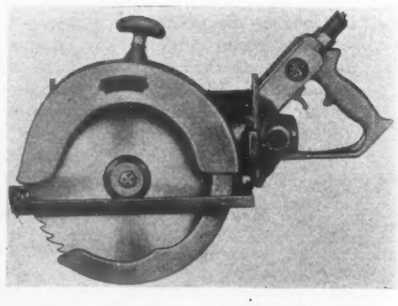


Reliance Type T motor for vertical operation

Reliance Type T, direct-current, heavy-duty motor for horizontal operation.

U. S. Portable Electric Saw

A portable electric hand saw has been recently placed on the market by the United States Electrical Tool Company, Cincinnati, Ohio. This saw is designed to cut wood, stone, slate and other materials and has ample power to saw the hardest wood, wet or dry. Only two adjustments are necessary to set this saw



Portable saw manufactured by the U. S. Electrical Tool Company

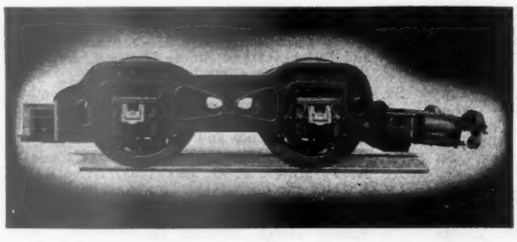
instantly for any depth and for any angle up to 60 deg. A patented beveling device does away with the need for a try-square. A clear-vision blower keeps the sawdust away from the markings so that it is easy to saw evenly. Top guard and automatic bottom guard protect the operator in all working positions. Ball bearings are used throughout on all models of this saw. It is made for depths of 1⅞, 2⅝, 3 1/16, 3 9/16 and 4⅛ in. The weight is 26¼ lb.

(Turn to next left-hand page)

THE BOOSTER PRINCIPLE
Results in Lowered Maintenance

WEARING of locomotive parts follows a definite law of nature. As the force thru the drivers is increased the cost of maintenance increases and the utilization of the locomotive decreases. In new power, The Locomotive Booster makes possible a reduction in the forces acting thru the drivers, yet the design of the locomotive yields equivalent power at all speeds as compared with a Non-Booster engine.

THE LOCOMOTIVE BOOSTER



The results--lower maintenance and increased utilization, yielding large returns on the small cost of the Booster.

Use the Booster to capitalize idle weight and spare steam as well as to reduce your maintenance cost.

FRANKLIN
RAILWAY SUPPLY CO., INC.
NEW YORK CHICAGO SAN FRANCISCO ST. LOUIS MONTREAL

THE FRANKLIN SLEEVE JOINT

Close coupling reduces overhang and wear and overcomes the tendency for connection to unscrew.

Among the Clubs and Associations

TORONTO RAILWAY CLUB.—The annual dinner of the Toronto Railway Club will be held at 7 p. m. on December 12 at the Royal York Hotel, Toronto, when an address on "Disarmament" will be presented by Lt. Col. Geo. Drew, commissioner, Security Frauds Prevention Board. This will take the place of the regular meeting.

CANADIAN RAILWAY CLUB.—A. M. Candee, general engineer of the Westinghouse Electric & Manufacturing Company at East Pittsburgh, Pa., will present a paper entitled "Modern Practice in Arc Welding, Design and Construction" at the meeting of the Canadian Railway Club which will be held at 8 p. m. on December 14 at the Windsor Hotel, Montreal. Slides will be used to illustrate the paper.

NORTHWEST CAR MEN'S ASSOCIATION.—A new organization, known as the Northwest Car Men's Association, has recently been organized in the Twin Cities, Minn., with the objectives of improving the acquaintance of car-department supervisors and inspectors in that territory, promoting a better understanding of the rules of interchange and mutual problems in that connection; and contributing to railway economy and better service. At the first meeting, held November 16, 300 new members were taken into this association, and it is anticipated that at least 200 more will be secured within the next few months. It is especially the purpose of the association to work in close co-ordination with other similar associations, rather than to compete with them. ¶At the first meeting of the association, which was addressed by E. J. Robertson, superintendent of the car department, Soo Line, the following officers were elected: President, F. J. Swanson, general car-department supervisor, Chicago, Milwaukee, St. Paul & Pacific, Minneapolis, Minn.; first vice-president, J. M. Ryan, assistant master car builder, Chicago, St. Paul, Minneapolis & Omaha, Hudson, Wis.; second vice-president, G. J. Conklin, foreman of inspectors, Minneapolis, St. Paul & Sault Ste. Marie, Minneapolis; treasurer, F. S. Leavitt, auditor, Minnesota Transfer Railway, St. Paul, Minn.; secretary, E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul. Meetings are to be held at 8 p.m. the third Monday of each month, with the exception of June, July and August, at the Minneasota Transfer Y. M. C. A. Gymnasium building, St. Paul.

Directory

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs:

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

ALLIED RAILWAY SUPPLY ASSOCIATION.—F. W. Venton, Crane Company, Chicago.

AMERICAN RAILWAY ASSOCIATION.—DIVISION V.—MECHANICAL.—V. R. Hawthorne, 59 East Van Buren street, Chicago.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey street, New York.

DIVISION I.—SAFETY SECTION.—J. C. Caviston, 30 Vesey street, New York.

DIVISION VIII.—CAR SERVICE DIVISION.—C. A. Buch, Seventeenth and H. streets, Washington, D. C.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth street, New York.

RAILROAD DIVISION.—PAUL D. Mallay, chief engineer, transportation department, Johns-Manville Corporation, 292 Madison avenue, New York.

MACHINE SHOP PRACTICE DIVISION.—Carlos de Zafra, care of A. S. M. E., 29 West Thirty-ninth street, New York.

MATERIALS HANDLING DIVISION.—M. W. Potts, Alvey-Ferguson Company, 1440 Broadway, New York.

OIL AND GAS POWER DIVISION.—L. H. Morrison, associate editor, Power, 475 Tenth avenue, New York.

FUELS DIVISION.—A. D. Black, associate editor, Power, 475 Tenth avenue, New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid avenue, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce street, Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 2276 Wilson avenue, Montreal, Que. Regular meetings, second Monday of each month except in June, July and August, at Windsor Hotel, Montreal, Que.

CAR DEPARTMENT OFFICERS ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 2514 West Fifty-Fifth street, Chicago. Regular meeting, second Monday in each month except June, July and August, Great Northern Hotel, Chicago, Ill.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 608 South Main street, Los Angeles, Cal. Meetings second Monday of each month except July, August and September, in the Pacific Electric Club building, Los Angeles, Cal.

CAR FOREMEN'S ASSOCIATION OF OMAHA, Council Bluffs and South Omaha Interchange.—Geo. Kriegler, car foreman, Chicago, Burlington & Quincy, Sixteenth avenue and Sixth streets, Council Bluffs, Iowa. Regular meetings, second Thursday of each month at Council Bluffs.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting first Tuesday in each month, except July and August, at American Hotel Annex, St. Louis, Mo.

CENTRAL RAILWAY CLUB OF BUFFALO.—T. J. O'Donnell, executive secretary, Room 1817, Hotel Statler, Buffalo, N. Y. Regular meeting, second Thursday each month, except June, July and August, at Hotel Statler, Buffalo.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 453 East Sixth street, Cincinnati. Regular meeting second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Alder avenue, Cleveland, Ohio. Meeting second Monday each month, except June, July and August, at the Auditorium, Brotherhood of Railroad Trainmen's building, West Ninth and Superior avenue, Cleveland.

EASTERN CAR FOREMEN'S ASSOCIATION.—E. L. Brown, care of the Baltimore & Ohio, Staten Island, N. Y. Regular meetings fourth Friday of each month, except June, July, August and September.

INDIANAPOLIS CAR INSPECTION ASSOCIATION.—P. M. Pursian, 823 Big Four building, Indianapolis, Ind. Regular meetings first Monday of each month at Hotel Severin, Indianapolis, at 7 p.m. Noon-day luncheon 12:15 p.m. for Executive Committee and men interested in the car department.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark avenue, Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, 3730 South Prieur street, New Orleans, La. Meetings third Thursday.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood street, Albany, N. Y.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Car Department Officers Association.

NATIONAL SAFETY COUNCIL—STEAM RAILROAD SECTION.—W. A. Booth, Canadian National Montreal, Que. William Penn and Fort Pitt Hotels, Pittsburgh, Pa.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic avenue, Boston, Mass. Regular meeting, second Tuesday in each month, excepting June, July, August and September. Copley-Plaza Hotel, Boston.

NEW YORK RAILROAD CLUB.—Douglas I. McKay, executive secretary, 26 Cortlandt street, New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth street, New York.

NORTHWEST CAR MEN'S ASSOCIATION.—E. N. Myers, chief interchange inspector, Minnesota Transfer Railway, St. Paul, Minn. Meeting third Monday each month, except June, July, and August, at Minnesota Transfer Y. M. C. A. Gymnasium building, St. Paul.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box, 3275, San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately.

PUEBLO CAR MEN'S ASSOCIATION.—I. F. Wharton, chief clerk, Interchange Bureau, Pueblo, Colo.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 1124 Woodward building, Washington, D. C.

RAILWAY CAR MEN'S CLUB OF PEORIA AND PEKIN.—C. L. Roberts, chief clerk, Peoria & Pekin Union Railway, 217 Lydia avenue, Peoria, Ill.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August, Ft. Pitt Hotel, Pittsburgh, Pa.

RAILWAY FIRE PROTECTION ASSOCIATION.—R. R. Hackett. Baltimore & Ohio, Baltimore, Md.

RAILWAY SUPPLY MANUFACTURERS' ASSOCIATION.—J. D. Conway, 1841 Oliver building, Pittsburgh, Pa. Meets with Mechanical Division and Purchases and Stores Division, American Railway Association.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

SUPPLY MEN'S ASSOCIATION.—E. H. Hancock, treasurer, Louisville Varnish Company, Louisville, Ky. Meets with Equipment Painting Section, Mechanical Division American Railway Association.

TORONTO RAILWAY CLUB.—J. A. Murphy, 1405 Canadian National Express building, Toronto 2, Ont. Meetings third Monday of each month, except June, July and August.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eight street, Cleveland, Ohio.

WESTERN RAILWAY CLUB.—J. H. Nash, 343 South Dearborn street, Chicago. Regular meetings, third Monday in each month.

(Turn to second left-hand page)

Faith and Courage

WITH the property investment of Class 1 railroads in the United States amounting to nearly $27,000,000,000, the highest tribute must be paid to the Executives and Directors of the Railroad Systems for their faith and courage in safeguarding the vast investments entrusted to their care, and more particularly in effecting many improvements which have benefitted travelers, shippers and industry in general.

Outstanding among recent improvements has been the introduction of Strictly Modern Locomotives—machines combining high speed with great tonnage hauling capacity. Such locomotives operate at greatly increased efficiency and with far lower maintenance costs, as compared with many of the locomotives built only a few years ago.

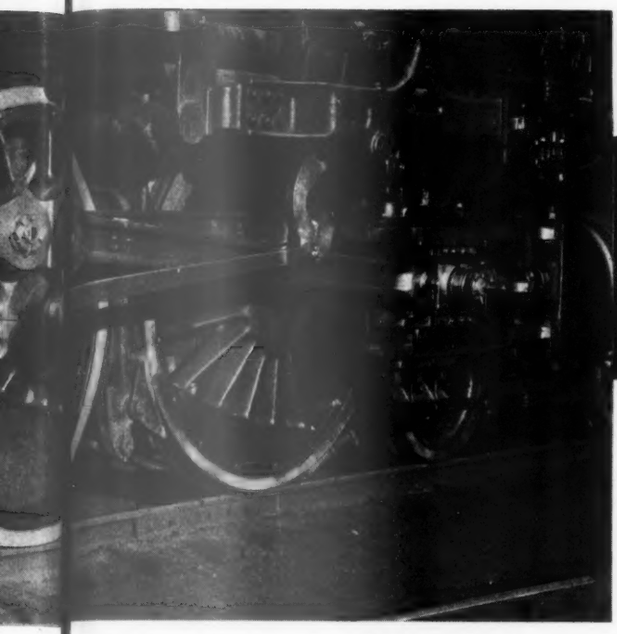
Motive power of the modern kind benefits all industry, and demonstrates that—

It takes Modern Locomotives to make money these days!

THE BALDWIN LOCOMOTIVE WORKS 1831 1931

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA



QUALITY
Always

CO FORGINGS

Add Dependability to the Business End of the Locomotive

WITH piston thrusts on modern locomotives ranging around 175,000 lb., the responsibility of transmitting this tremendous power rests entirely upon the structural stamina of the piston rods, guides, side rods, crank pins and axles. They must not fail. In fact, it is their dependable performance that has made possible the modern locomotive with its big drawbar pull at high freight and passenger speeds.

Only quality forgings, with that extra measure of dependability can stand up under the terrific stresses of hard service. ALCO Forgings are just that kind—quality all ways—quality always. Back of every ALCO Forging stands years of forging experience, metallurgical research and scientific manufacturing methods. As locomotive builders there is that spirit of responsibility—that constant urge to produce superior forgings which enhance the dependability and efficiency of the assembled locomotive.

ALCO standards are high—always have been—always will be. Only the finest raw materials are used in ALCO Forgings. All billets are tested for chemical properties and physical soundness. They are properly pre-heated before forging and later heat-treated to insure the best in grain refinement and the highest ductility with the desired tensile strength.

To entrust ALCO with the manufacture of all your locomotive forgings is to guarantee dependability to the business end of your locomotives and big economies for your railroad.

American Locomotive Company
30 Church Street New York N.Y.

NEWS

THE NEW YORK CENTRAL has opened negotiations with its unionized workers with the object of having them accept a 10 per cent reduction in wages for a period of one year. The announcement, issued on October 30, said that "confirmation was given today at the executive offices of the New York Central Railroad to reports that representatives of the various classes of the system's employes are engaged in discussions with a view to the entire personnel voluntarily taking a 10 per cent pay reduction for one year."

C. P. R. Re-opens Shops

EIGHT THOUSAND railway workers in six provinces in Canada returned to work November 17, when the Canadian Pacific reopened its principal shops which were closed in September as a measure of economy.

In Angus Shops, Montreal, 4,500 have returned to work, while the remaining 3,500 workers are distributed over the following shops; McAdam Junction, N. B., Carleton Place, Ont., West Toronto, Ont., North Bay, Ont., Weston Shops, Winnipeg; Ogden Shops, Calgary, and Vancouver shops.

experimental installation, and the Southern made favorable response to this suggestion.

The apparatus is described in a recent issue of the Railway Gazette (London). This line where the system was tried is operated by the manual block system and the locomotive is fitted with the automatic vacuum brake. Inductors fixed on the ties between the rails have magnetic effect on a receiver fixed on the locomotive in front of the leading axle, and an armature of this receiver, when moved, acts on the vacuum pipe of the brake system.

The system includes a speed control arrangement, but this has not yet been put in use. With this, actuated by an axle of the locomotive, it is proposed to prevent the use of the acknowledger (which is substantially a forestaller), except when the speed of the train is less than 25 m.p.h.

This system is to be tried on the London, Midland & Scottish, in Derbyshire.

Centenary of the John Bull

THE OLD PENNSYLVANIA Railroad locomotive "John Bull," the first locomotive to run in the state of New Jersey, which Pennsylvania system. There was, however, no regular steam service for about two years, horses being used until 1833.

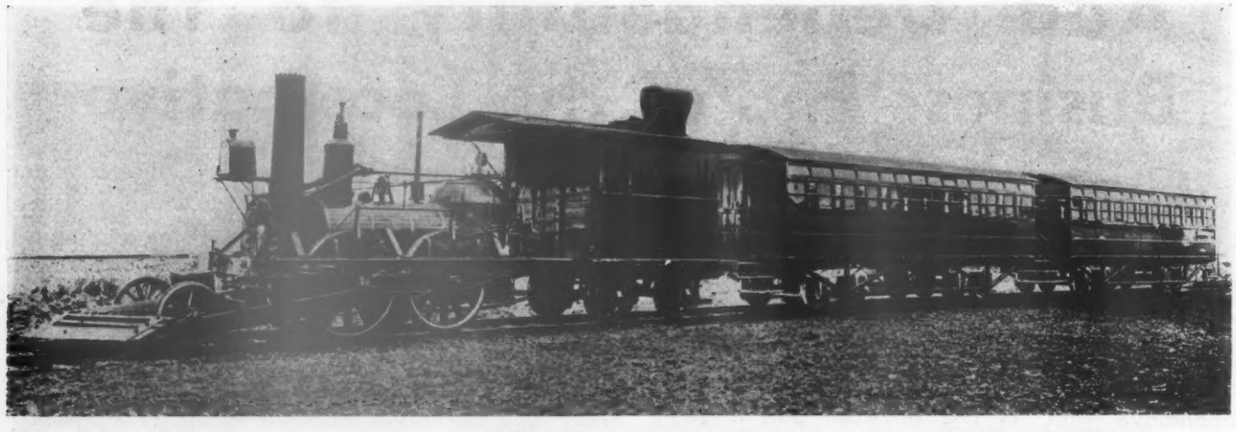
The exhibition includes an elaborate series of photographs within the passenger car; and, on a pedestal near the train, a replica of the monument at Bordentown, N. J., which marks the location of the first piece of track laid on the Camden & Amboy.

In 1893, the John Bull was run from Jersey City to Chicago, under its own steam, for exhibition at the Columbian Exposition. The picture of the locomotive, tender and two 8-wheel cars, printed herewith, shows the train as it appeared in that year. The pilot, with its two wheels, and the tender, were additions made some time subsequent to 1831.

The cars, as re-conditioned in 1893, were said to appear substantially as they did when built, though they had new seats, and new wheels and axles.

Railway Executives Hold Conference with Labor Leaders

REPRESENTATIVES of railway labor organizations, headed by D. B. Robertson, president of the Brotherhood of Locomotive Firemen & Enginemen and chairman of the Railway Labor Executives' Association, met with a committee of railway presidents, headed by Daniel Willard, president of the Baltimore & Ohio, in New York on November 19, for the purpose of discussing matters of mutual interest.



The John Bull and its train

First locomotive operated in New Jersey. Engine, tender and cars reconditioned in 1893.

Strowger-Hudd Automatic Train Control

ON THE SOUTHERN RAILWAY of England, at Byfleet, there has been in regular use since March last, on the locomotive "Sir Gaheris," the Strowger-Hudd system of automatic train control, the proprietor of which is "Automatic Electric, Inc." of Chicago; but all the apparatus for which is said to be British made. This system was noticed in the report of the British Automatic Train Control Committee dated November 3, 1930, but without any formal commendation, the apparatus not having been tried. The government committee suggested that some road should make an

for many years has been in retirement at the Smithsonian Institution at Washington, during November celebrated the centenary of its first use, which was on November 12, 1831. The engine, with its tender and one passenger car, is now on display in the Hall of Transportation of the Institution. It has been jacked up off the ancient rails on which it stands so that the wheels can be revolved, compressed air, not steam, being used as the motive power.

This engine arrived from England in August, 1831, and two months later was used to haul the first passenger train over the Camden & Amboy, now a part of the

The meeting resulted from the acceptance by railway presidents of the Railway Labor Executives' Association suggestion that a joint conference be arranged to discuss "any proposal affecting railway operation which railway managements desire to advance" and "any proposals, including present and future relief of unemployment and stabilization of employment" which the labor organizations desire to advance.

Announcement that the invitation had been accepted was made in a statement issued by Mr. Willard following a meeting of the Association of Railway Execu-

(Continued on next left-hand page)

The MARK of EXTRA SERVICE

STAMPED on Carnegie Wrought Steel Wheels, the initials "R T" (Rim Toughened) identify wheels particularly adapted to modern heavy-duty service—wheels that will give you greater service, greater safety, greater economy. These initials indicate the additional refinement of heat treatment, the process of which produces a wheel with an especially tough rim and with high physical properties—a wheel that has been demanded by, and made especially for the ever-increasing weight and speed of modern transportation. Accurate machining insures perfect rotundity with a consequent increase in riding comfort.

Carnegie Rim-Toughened Wrought Steel Wheels are furnished for passenger, engine truck and tender service. Carnegie Light Weight Freight Car Wheels, rim-toughened, are also available for 70-ton freight service.

The outstanding advantages of wrought steel are well known. Let our wheel engineers bring you complete details of this further improvement. Carnegie Rim-Toughened Wrought Steel Wheels have created a new standard of service and value.

CARNEGIE STEEL COMPANY PITTSBURGH, PENNA.

Subsidiary of United States Steel Corporation

154

CARNEGIE WROUGHT STEEL WHEELS

tives at New York City on November 13.

The following are the salient features of the program made public by the Railway Labor Executives' Association:

"A definite number of employees should be assured permanent employment and auxiliary forces should be assured part-time employment, thus ending the feeling of insecurity on the part of a large proportion of railroad workers.

"Creation of a mobile force of extra workers, shifting from road to road, as rolling stock is now shifted to meet traffic requirements. Through co-ordinated effort of managements and labor, average earnings per employee could be raised without a wage increase and labor efficiency would be augmented.

"Motor transport should be required to observe the same principles of safe, efficient and socially just operation as are required of the railways. Railway employees displaced by motor transport should be given the opportunity to enter that field.

"The working day should be shortened and reductions in working force should be brought about by employing fewer new men and reducing hours of labor.

"The principal wage-lowering factor in railroad work is part-time employment. Stabilization would remedy this evil.

"There should be provision for a payment on dismissal to all experienced employees discharged. There should be federal legislation providing for pensions and workmen's compensation.

"There should be set up pay roll reserves to maintain employees' compensation during depression."

The following immediate measures were proposed:

"Insuring one year's employment to the necessary employees in each class, thus freeing 1,250,000 workers from the fear of unemployment and increasing the purchasing power of a $2,000,000,000 pay roll.

"Creation of a joint commission to study ways and means of applying the six-hour day to the different classes of employees.

"Joint action to promote a $1,000,000,000 federal bond issue for grade crossing elimination; to regulate highway transport and find jobs in it for furloughed railroad employees; to protect the interests of all in consolidation; to promote federal pension and compensation insurance legislation; to establish an emergency employment bureau; and to co-ordinate train crews and train lengths 'on the basis of economical, safe operation.'"

Supply Trade Notes

A. A. PROBECK has been appointed sales manager of the Federal Machine & Welder Company, Warren, Ohio.

GEORGE H. MALONY has been elected secretary of Whitman & Barnes, Inc., Detroit, Mich., to succeed J. I. Holton, resigned.

WILLIAM P. WITHEROW, vice-president of the Republic Steel Corporation, has resigned to devote his time to private interests.

J. B. BERRYMAN, first vice-president of the Crane Company, Chicago, has been elected president to succeed R. T. Crane, Jr., deceased.

CLINTON S. DOW, member of the firm of Greer, Crane & Webb, New York, has been elected president of the Ardco Manufacturing Company, Hoboken, N. J., to succeed H. Otto Wittpenn, deceased.

HARRY L. ERLICHER, assistant purchasing agent of the General Electric Company, Schenectady, N. Y., has been appointed purchasing agent, succeeding L. G. Banker, retired.

BOYD FISHER has been appointed general manager of the National Machine Tool Builders' Association, Cincinnati, Ohio, succeeding Ernest F. DuBrul, resigned.

THE PAGE STEEL & WIRE COMPANY, Bridgeport, Conn., has opened a southeastern district sales office at 1520 Healey building, Atlanta, Ga. R. J. Teeple has been placed in charge.

L. W. ERICKSON has been appointed district representative for the Milwaukee and Wisconsin territory of the Foote Brothers Gear & Machine Company, Chicago, to succeed E. L. Parsons.

THE CHICAGO PNEUMATIC TOOL COMPANY, New York, has moved its offices and service station at Seattle, Wash., from 1743 to 3201 First Avenue, South, and C. Kirk Hillman has been appointed district manager.

EDWARD C. KENYON, representative, at Chicago, of the Ashton Valve Company, Cambridge, Boston, Mass., has been appointed Pacific Coast representative with headquarters at San Francisco, Cal., in charge of sales of the railroad and industrial departments.

RALPH W. PAYNE has been appointed district railroad representative in the southeastern states, with office at 613 Fifteenth street, N. W., Washington, D. C., of the American Hoist & Derrick Company, St. Paul, Minn.

CHATARD & NORRIS, 218 Water street, Baltimore, Md., have been appointed exclusive representatives for the eastern part of Maryland and the District of Columbia, of the Homestead Valve Manufacturing Company, Inc., Coraopolis, Pa.

FRANK W. BLAKE, formerly in the railroad machine tool department of Manning, Maxwell & Moore, Inc., and its successor, the Dean Machinery Company, has been appointed general sales manager of the A & E Company, Chicago.

JOHN A. ROCHE, representative of the Syntron Company, Pittsburgh, Pa., has been appointed district representative for the Chicago territory, with headquarters at 1419 Buckingham building, 59 East Van Buren street, Chicago.

A. W. THOMPSON, vice-president and Pacific Coast manager in charge of sales of Fairbanks Morse & Co., with headquarters at San Francisco, Cal., has been elected vice-president in charge of manufacturing, with headquarters at Beloit, Wis., to succeed W. B. Heath, resigned.

THE RAILROAD SUPPLY COMPANY, Chicago, filed a voluntary petition in bankruptcy on October 27, and on the same day the Federal Court appointed Fred E. Hummel, 105 W. Adams street, Chicago, receiver. The receiver has announced that he will continue to operate the business, filling all orders for repairs and new supplies.

F. A. KEIHN, who has been sales engineer, automotive car division, of the J. G. Brill Company, Philadelphia, Pa. since 1924, has been appointed sales engineer of the company and is now in charge of all sales engineering matters. He reports to Charles O. Guernsey, recently appointed chief engineer in charge of all Brill engineering activities.

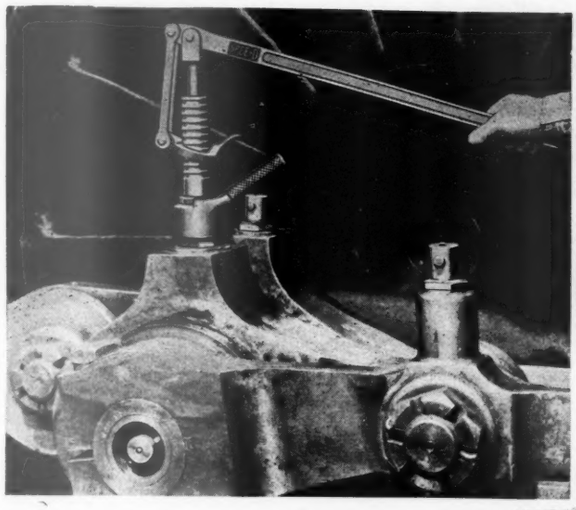
THE RAILROAD MATERIALS CORPORATION, 30 Church street, New York, has been organized by H. M. Buck as president and A. H. Smith as vice-president. Mr. Buck was formerly vice-president and Mr. Smith was formerly sales representative of the Railroad Supply Company, with headquarters at New York. The new organization will act as sales representatives of manufacturers of railway supplies.

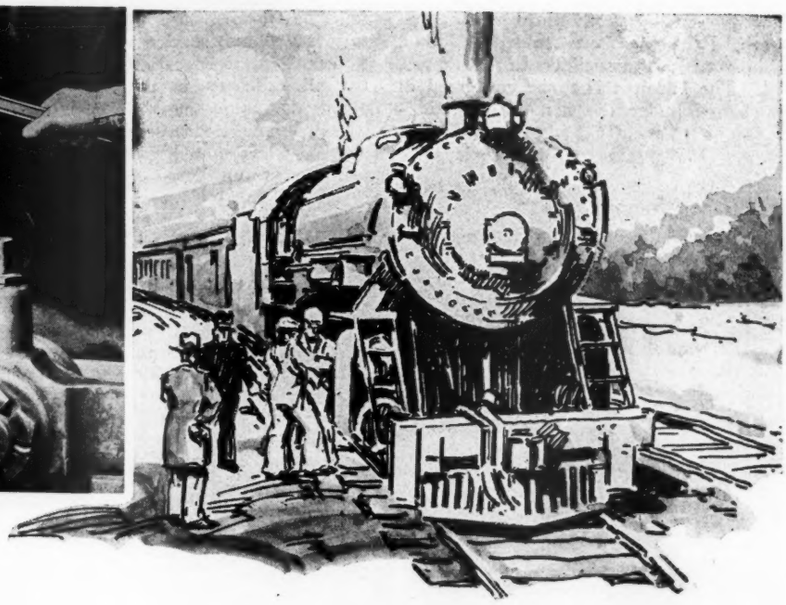
H. W. KILKENNY, St. Louis, Mo., branch office manager of the Ohio Brass Company, Mansfield, Ohio, has resigned. Mr. Kilkenny, who has been actively identified with the electrical industry since 1907, is financially interested in his brother's company, the J. G. Kilkenny Company, manufacturers agents, Cleveland, Ohio.

(Turn to next left-hand page)

Domestic Orders Reported During November, 1931

Name of Company	Number Ordered	Type	Builder
Locomotives			
Lehigh Valley	10	4-8-4	American Loco. Co.
	10	4-8-4	Baldwin Loco. Works
Total for month	20		
Freight Cars			
U. S. Navy Department	3	Flat	Haffner-Thrall Car Co. (Chicago)
Boston & Maine	25	Caboose	Company shops (Concord, N. H.)
Total for month	28		





"No More Failures

Due to hot pins or cut bushings"

THIS statement was recently made by a Master Mechanic in charge of a large engine terminal which handles over one hundred locomotives every day.

"Since standardizing on the 'SPEE-D' method of rod cup lubrication" he continued, "rod bearings no longer give us any trouble."

"This is due to the fact that the 'SPEE D' method insures clean lubrication as well as thorough lubrication. No cinders, sand or other gritty materials can get by the ball check of a 'SPEE D' Filler Neck providing the grease itself is clean."

In addition to the savings in rod bearing maintenance this terminal has reduced its engine preparation costs at least one hundred dollars per locomotive per year.

Worth While, is it Not?

RELIANCE MACHINE & STAMPING WORKS, Inc.

NEW ORLEANS, LA.

Agents and Representatives

H. C. MANCHESTER, 3736 Grand Central Terminal, New York City
A. L. DIXON, 325 W. Ohio St., Chicago
CONSOLIDATED EQUIPMENT COMPANY, Montreal
MUMFORD MEDLAND, LTD., Winnipeg
INTERNATIONAL RAILWAY SUPPLY COMPANY, 30 Church St., New York City

Saves Time, Labor, Grease and Grease Plugs

Trade Mark Registered

THE BUSINESS and good will of the McConway & Torley Company of Pittsburgh, Pa., have been sold to Donald Symington and associates of Baltimore, Md. The business is to be continued in Pittsburgh under the name of the McConway & Torley Corporation, with no material changes in existing personnel.

W. J. WIGNALL, formerly vice-president of the Locomotive Terminal Improvement Company, has been appointed director of railroad sales for the A. M. Byers Company, with headquarters at Pittsburgh, Pa.; J. H. Ainsworth is assistant to Mr. Wignall and railroad department representation will be maintained in New York by C. W. Damberg, in Chicago by F. W. Stubbs and in Pittsburgh by C. A. Croft.

W. J. Wignall

Mr. Wignall graduated from Armour Institute of Technology in 1920, his education having been interrupted in 1917 when he enlisted in the United States Army and served overseas in the 127th Engineers until August, 1919. Upon graduation, he became resident engineer in charge of construction for G. L. Clausen, consulting engineer, which position he held until 1922. From the latter date until 1925, he was in the employ of the National Boiler Washing Company, holding positions of construction foreman, assistant to the vice-president in charge of purchases and sales engineer. In 1925, he joined the Locomotive Terminal Improvement Company, serving as sales engineer and later as vice-president, in which capacity he recently resigned. During part of this period, he also held the position of vice-president and director of Railway Hydraulic Systems, Inc.

C. L. SCHNEIDER, who, for the past 14 years, has been connected with the Fruehauf Trailer Company, Inc., Detroit, Mich., serving in various departments, including engineering and sales, has been appointed manager of the company's branch at Chicago, formerly located at 2711 S. Wabash avenue, and now at Michigan avenue and Twenty-ninth street. Frank L. Tully, who has been with the company since 1926, has been appointed manager of the branch at Cleveland, Ohio. He succeeds Harry S. Moore, for many years Cleveland branch manager, who has been promoted and will devote all his time to a special sales assignment.

THE HOPKINS-BENEDICT COMPANY, Chicago, has taken over the distribution, factory sales and service of the Portable Power Tool Corporation, Warsaw, Ind., for all railroads in the United States. Harry D. Stops has been elected vice-president and treasurer and A. C. Thom has been appointed sales and service engineer of the former company.

G. B. ALLISON has opened an office at 50 Church street, New York, as manufacturer's agent. He is representing the Excel Curtain Company, Inc., and solicits accounts of other supply companies. Mr. Allison was formerly district sales manager at New York of the Curtain Supply Company, for eight years, and for the past three years served in the same capacity with the O. M. Edwards Company, Inc.

CHARLES A. LIDDLE, president of the Pullman Car & Manufacturing Corporation, Chicago, has been elected also president of the Standard Steel Car Corporation, a subsidiary of Pullman, Inc., to succeed Patrick H. Joyce, who has been elected chairman of the board of the Standard Steel Car Corporation, as a result of his election as president of the Chicago Great Western. The selection of Mr. Liddle as president of the Standard Steel Car Corporation follows his completion of 31 years in the car building industry, of which 15 have been with the

Charles A. Liddle

Haskell & Barker Car Company and its successor, the Pullman Car & Manufacturing Corporation. His association with Pullman Car includes the period of the company's greatest development. On June 18, 1924, the Pullman Car & Manufacturing Corporation was incorporated to take over all the property, assets and business of the manufacturing department of the Pullman Company, which had manufactured railway equipment since 1867. The facilities acquired also include the properties of the Haskell & Barker Car Company which the Pullman Company absorbed in 1921. This expansion was extended in January, 1930, when Pullman, Inc., acquired the Standard Steel Car Company, and the Osgood-Bradley Car Company, which it has since operated as a group, the Standard Steel Car Corporation, separately from the properties of the subsidiary, the Pullman Car & Manufacturing Corporation. In the same year, the Pullman-Standard Car Export Corporation was organized to take over the Middletown Car Company and to handle the export business of the manufacturing subsidiaries of Pullman, Inc.

Mr. Liddle was born in Philadelphia, Pa., and was educated at the Central Manual Training School, Philadelphia, and Drexel Institute. He entered business as an employee of the Allison Manufacturing Company at Philadelphia, and later served the Jackson & Sharpe Company and the Harlen & Hollingsworth Company at Wilmington, Del., and the Pressed Steel Car Company at Allegheny, Pa. In 1901 he entered the employ of the American Car & Foundry Company as an engineer, later being promoted to assistant to the vice-president and then to general manager. On January 1, 1916, he resigned to become vice-president of the Haskell & Barker Car Company, Michigan City, Ind., which position he held until January 14, 1922, when the company was absorbed by the Pullman Company and he was elected vice-president of the latter company. In 1924 he was made vice-president of the Pullman Car & Manufacturing Corporation and in November, 1928, president of the latter company.

ROBERT S. BINKERD, formerly vice-chairman of the Eastern Railroads' Committee on Public Relations, who has been appointed director of sales of the Baldwin Locomotive Works, with headquarters at Philadelphia, Pa., was born on November 7, 1882, at Dayton, Ohio, and was graduated from Yale University in 1904. He then served for four years as secretary of the Municipal Voters' League at Buffalo, N. Y. In 1908 and 1909 he was secretary of the Citizens' Union in New York and served in the same capacity with the City Club of New York from 1909 to 1917. During the latter year he became advisor to the Fusion Committee in the

Robert S. Binkerd

New York City municipal election, and later in the same year, joined the organization of the Association of Railway Executives in New York as assistant to the chairman, in which capacity he was closely identified with the association's public relations work. In 1922 he was appointed vice-chairman of the Committee on Public Relations of the Eastern Railroads and resigned in September, 1927, to become

(Continued on next left-hand page)

a general partner in the New York stock exchange firm of James H. Oliphant & Co. Mr. Binkerd later forsook this connection, but has continued up to the present his active association with financial enterprises in New York.

The Wright Manufacturing Company, Bridgeport, Conn., has moved its general sales office from that city to York, Pa.

JAMES C. YOUNGLOVE, general sales manager of the Western division, transportation and government department, of the Johns-Manville Corporation, New York, with headquarters in Chicago, has resigned to become general manager of the transportation and government division of the American Hair & Felt Company and the Dry-Zero Corporation, with headquarters in the Merchandise Mart at Chicago. The appointment of Mr. Younglove, who will continue to specialize in insulations for the transportation field, follows the establishment by these two companies of their own direct sales organization for the purpose of marketing their products in the railroad and general transportation fields. Heretofore, this has been done through a sales agency. Mr. Younglove was born on August 7, 1879, at Crescent, Saratoga County, N. Y., and attended Armour Institute of Technology at Chicago. After spending several years with the National Lead Company, he joined with J. E. Meek in organizing the railroad department of the Johns-Manville Corporation, with which company he has been identified for nearly 30 years. For a period of several years he was a director of the company.

Obituary

C. HASTINGS, retired vice-president of the Locomotive Finished Material Company, Atchison, Kan., died on November 17.

ALBERT JEFFERSON SAYERS, an engineer of the Link-Belt Company, Chicago, died at his home in Chicago, on October 11, at the age of 61.

A. H. DARKER, chief electrical engineer for J. Stone & Co., Ltd., London, England, died on November 15, at Brisbane, Australia, where he was visiting. During his career of over 30 years with this company Mr. Darker had made many trips around the world in connection with the Stone system of car lighting.

RICHARD T. CRANE, JR., president of the Crane Company, Chicago, died on November 7 in New York after an illness of 10 days. Mr. Crane was born in Chicago, on November 7, 1873, and graduated from the Sheffield Scientific School of Yale University in 1895. In the following year he entered the employ of the Crane Company, which was founded in 1855 by his father, and after a year spent in the foundries, entered the office in the city sales department. In 1898 he was elected second vice-president, which position he held until 1914, when he was elected president.

EDWARD E. GOLD, inventor of a car heating system now in use on many railroads in the United States, Canada and Europe, died of a heart attack at his home in New York on October 30, at the age of 84. Mr. Gold was born at Waverly, Ill., and was educated in a private school at

Edward E. Gold

Washington, Conn. At the age of 18 he entered the employ of the Scovill Manufacturing Company, New York. In 1882 he invented the system for heating railroad cars with steam from the locomotive by means of a steam hose coupler. Mr. Gold had obtained more than 100 American and foreign patents. After the railroads began using electricity as motive power, especially on suburban trains, Mr. Gold developed an electric heater for railroad use. Soon after inventing his steam-heating system, Mr. Gold organized the Gold Car Heating Company which was reorganized on account of expansion of business in 1903 as the Gold Car Heating & Lighting Company, of which Mr. Gold was president until three years ago when he resigned to become chairman of the board. He maintained an active interest in the business until the time of his death.

CHARLES L. HEISLER of the engineering general department of the General Electric Company, Schenectady, N. Y., died at his summer home at Rock City Falls, near Saratoga, N. Y., on October 13. Mr. Heisler was born on February 22, 1863, at Wapakoneta, Ohio, and was graduated from Cornell University in 1890, with the degree of M. E. Mr. Heisler first served with the Brooks Locomotive Works, Dunkirk, N. Y., and subsequently with the Dunkirk Engineering Company. While with the latter organization he developed the Heisler type of geared locomotive, the manufacture of which was taken over by the Baldwin Locomotive Works and later by a group of business men of Erie, Pa. He was also with Bement, Miles & Company, where he developed a high duty reciprocating pumping engine which was manufactured by the Heisler Pumping Engine Company, of which he was vice-president and chief engineer until 1907 when the plant was discontinued. He then became connected with the American Locomotive Company as a member of its staff of mechanical engineers, and at a later period served as mechanical engineer of the Washington Steel & Ordnance plant. He joined the General Electric organization in 1922, and was in charge of the mechanical engineering branch of the general superintendent's office. From 1926 until the time of his death he was in the engineering general department. Among his principal inventions, in addition to the Heisler geared locomotive, were various types of pumping engines and machinery, steam road rollers, barometric condensers and the wet type vacuum pump. He had been granted 21 patents since joining the staff of the General Electric Company.

WILLIAM K. BIXBY, a former president of the American Car & Foundry Company who died in St. Louis, Mo., on October 29, from myocarditis, was born at Adrian, Mich., on January 2, 1857, and received the degree of master of arts at Amherst College in 1913, and the degree

Strauss Studio

William K. Bixby

of doctor of law at the University of Missouri in 1907. He entered railway service in 1873 as a baggageman on the International Great Northern at Palestine, Tex., and later was employed in the baggage department of the Houston Union Station and still later, as general baggage agent of the International Great Northern. After he had been with the railroad several years, Mr. Bixby joined the Missouri Car & Foundry Company and, after becoming president of this company, played a prominent part in the merger with the Michigan Peninsular Car Company. This merger was the first step in the consolidation of 13 firms which in 1899, formed the American Car & Foundry Company, of which Mr. Bixby was appointed president. Soon after the consolidation, he became chairman of the board and in 1905, retired. Since his retirement, he served as one of the receivers of the Wabash from 1909 to 1914, and a director of the St. Louis Union Trust Company and engaged in many civic enterprises. He was a charter member of the Incorporation of the American Red Cross, and had served as honorary president of the Provident Association and Archaeological Society, president of the City Art Museum of St. Louis, president of Washington University, a trustee of the Y. W. C. A. Endowment Fund, and a director of the National Gallery of Arts, Washington, D. C.

(Turn to next left-hand page)

Specializing in meeting your particular requirements

THE men responsible for the control of the operations of manufacture in the Bethlehem Alloy Steel Plant are specialists in the art of making steel that is just suited to the customer's requirements in every particular, both as to the properties that make for long life in the intended service and those that facilitate working in the shop.

The thorough understanding of the problems of alloy steel users which makes this close co-operation possible is the result of many years of experience in manufacturing alloy steels for every industry using these materials. Bethlehem Metallurgists have always worked with customers in solving the problems arising in the application of alloy steels to their uses. In this way a great fund of information pertaining to the handling of alloy steels so as to obtain the highest possible degree of satisfaction has been obtained, and is available to help in solving your alloy steel problems.

BETHLEHEM STEEL COMPANY, General Offices: Bethlehem, Pa.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Buffalo, Cleveland, Cincinnati, Detroit, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Seattle, Portland, Honolulu

Export Distributor: Bethlehem Steel Export Corporation, 25 Broadway, New York City

BETHLEHEM

Alloy BETHLEHEM STEEL *Steels*

Personal Mention

General

J. W. SENGER, superintendent of rolling stock of the New York Central, Lines West of Buffalo, with headquarters at Cleveland, Ohio, has had his jurisdiction extended to include the Ohio Central Lines.

W. F. ACKERMAN, superintendent of shops on the Chicago, Burlington & Quincy, Lines West, of the Missouri river, at Havelock, Neb., has been transferred to Lines East of the Missouri river, at West Burlington, Iowa, to succeed H. C. Gugler.

Master Mechanics and Road Foremen

J. S. FORD has been appointed assistant master mechanic of the Chicago and Aurora divisions of the Chicago, Burlington & Quincy, with headquarters at Aurora, Ill.

T. E. PARADISE, master mechanic of the Alliance division of the Chicago, Burlington & Quincy, with headquarters at Alliance, Neb., has had his jurisdiction extended to include the Sterling division.

H. C. GUGLER has been appointed master mechanic of the Galesburg and East Ottumwa divisions, of the Chicago, Burlington & Quincy, with headquarters at Galesburg, Ill., succeeding G. P. Trachta.

G. B. PAULEY, master mechanic of the Casper division of the Chicago, Burlington & Quincy at Casper, Wyo., has beeen appointed assistant master mechanic of the Sterling division, with headquarters at Sterling, Colo.

RICHARD KLING has been appointed assistant master mechanic of the Central Kansas, Colorado and Wichita divisions of the Missouri Pacific, with headquarters at Wichita, Kan.

G. T. CALLANDER, master mechanic of the Central Kansas and Wichita divisions of the Missouri Pacific, with headquarters at Osawatomie, Kan., has had his jurisdiction extended to include the Colorado division, succeeding W. C. Smith.

G. P. TRACHTA, master mechanic of the Galesburg and East Ottumwa divisions of the Chicago, Burlington & Quincy, at Galesburg, Ill., has been transferred to the La Crosse division, with headquarters at North La Crosse, Wis.

W. C. SMITH, master mechanic of the Missouri Pacific at Hoisington, Kan., has been transferred to Dupo, Ill., with jurisdiction over the Dupo terminals of the St. Louis Terminal division and the Illinois division, including the Missouri-Illinois, east of the Mississippi river.

A. B. WILSON, assistant master mechanic of the Portland division of the Southern Pacific, Pacific Lines, with headquarters at Eugene, Ore., has been promoted to master mechanic of the same division, with headquarters at Portland, Ore., to succeed C. L. Gibson, who has retired.

C. R. DAVENPORT, master mechanic of the Sterling division of the Chicago Burlington & Quincy at Sterling, Colo., has been transferrred to Casper, Wyo., with jurisdiction over the Casper and Sheridan divisions.

Shop and Enginehouse

J. M. HOUSEHOLDER, JR., general enginehouse foreman of the Southern at Spencer, N. C., has been transferred to the position of night enginehouse foreman at Winston-Salem, N. C.

E. R. BLACKMON, assistant day enginehouse foreman of the Southern at Spencer, N. C., has been appointed assistant night enginehouse foreman.

R. B. STEWART, assistant day enginehouse foreman of the Southern at Spencer, N. C., has been promoted to the position of night enginehouse foreman.

R. B. WHEELER, enginehouse foreman of the Southern at Birmingham, Ala., has been promoted to the position of general foreman, with headquarters at Danville, Ky.

L. G. TREXLER, night enginehouse foreman of the Southern at Winston-Salem, N. C., has been transferred to the position of assistant enginehouse foreman, day, at Greensboro, N. C.

Purchasing and Stores

B. A. AIKENS, purchasing agent of the Michigan Central, has been appointed local purchasing agent at Detroit, Mich.

HARRY CARTER has been appointed local purchasing agent of the Michigan Central at Cincinnati, Ohio.

H. C. PEARCE has resigned as director of purchases and stores of the Chesapeake & Ohio and the Pere Marquette.

G. S. WRIGHT, general storekeeper of the Elgin, Joliet & Eastern with headquarters at Joliet, Ill., has retired after 35 years of continuous service with that road.

Obituary

P. T. DUNLOP, retired superintendent of motive power of the St. Louis-San Francisco, died at his home at Willard, Mo., on October 4.

E. F. HASBROOK, purchasing agent of the Chicago, Burlington & Quincy, with headquarters at Chicago, died on November 22, in the Presbyterian hospital at that point, of pneumonia.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

CONTINUOUS BLOW-DOWN SYSTEM.—The Elgin continuous blow-down system for boiler plants, with the Eckel precision control, is described in a four-page folder issued by the Elgin Softener Corporation, Elgin, Ill.

POTENTIOMETER PYROMETER.—The Brown Instrument Company, Philadelphia, Pa., describes and illustrates in its new 16-page booklet the principal features of the new Brown Potentiometer pyrometer.

LUKENWELD CONSTRUCTION.—The problems encountered in the development of the Lukenweld type of gear construction are described by Everett Chapman, director of engineering and research, in an eight-page bulletin issued by Lukenweld, Inc., Coatesville, Pa.

TAPS.—A comprehensive booklet covering Class S collapsing taps has been issued by The Geometric Tool Company, New Haven, Conn. The taps are applicable to most standard makes of machines and can be readily converted from one type of trip to another.

NICKEL-STEEL SPECIFICATIONS.—The International Nickel Company, 67 Wall street, New York, has issued Nos. 1 to 8 of its Recommended Specifications for Nickel Alloy Steel in railroad applications. These cover forging billets, normalized and tempered low-carbon forgings, boiler and firebox plates, castings, nickel engine

SMOOTH-ON.—"Helpful Ideas for Engineers" is the title of a booklet issued by the Smooth-On Manufacturing Company, 568 Communipaw avenue, Jersey City, N. J. This booklet contains an abbreviated description of the more simple and common types and places for application of Smooth-On cements.

HIGH TEMPERATURE MORTARS.—"High Temperature Mortars and Plastic Chrome Ore" is the title of a booklet being issued by the General Refractories Company, 106 South Sixteenth street, Philadelphia, Pa. The advantages and applications of high temperature mortars and plastic chrome ore are described in this booklet.

PUTNAM PRODUCTS.—The Putnam Machine Works of Manning, Maxwell & Moore, Inc., 100 East Forty-Second street, New York, presents in an illustrated catalog of 72 pages a diversified line of machine tools for industrial service and a specially designed line for railroad shop service. The catalog is attractively bound and is of pocket size. Separate pieces of literature have also been issued describing Putnam double housing planers, open-side planers, the 90-in. quartering and pin turning machine, unit heads for milling machines, the Shaw electric drop pit table, etc.

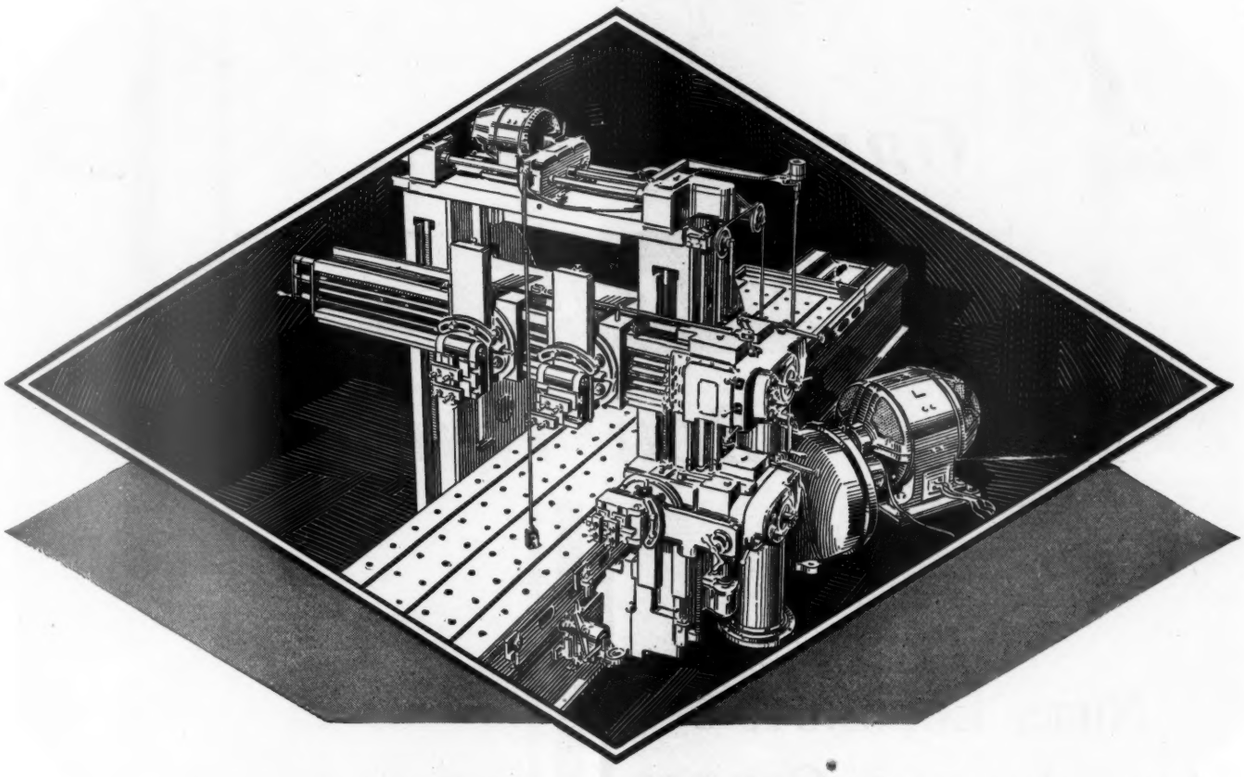
Railway Mechanical Engineer

FOUNDED IN 1832

December 1931

35¢

Vol. 105. No. 12
Published monthly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 10, 1928, at the post office at East Stroudsburg, Pa., under the act of March 3, 1879.



BORN *of* GIANTS

The Sellers Spiral Gear Drive Planer is one of a large family of production tools including such machines as Floor Boring Machines, enormous Boring Mills, Railroad Driving Wheel and Car Wheel Lathes, Locomotive Driving Box Borers and others.

To constantly improve the entire Sellers line of tools—to design not only for present production needs, but to anticipate future requirements—is the problem of a group of engineers occupying a unique position in the machine tool industry.

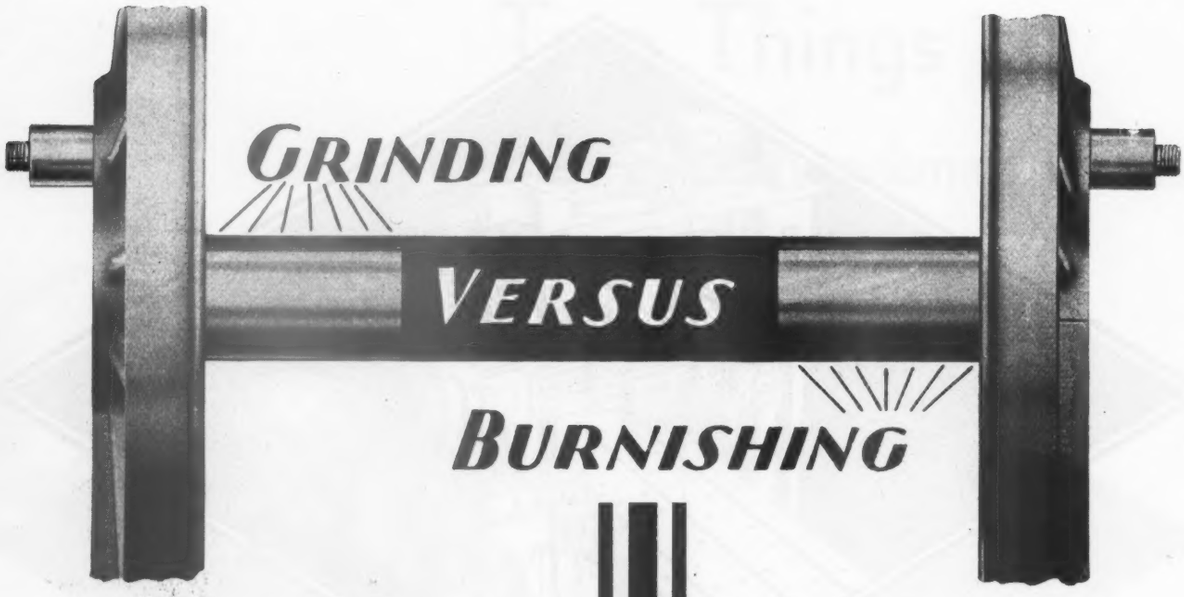
The Sellers Planer, sharing with the larger tools this unusual engineering background, reflects the same sound fundamental principles of design—embodies all the advanced ideas for improved efficiency, increased production capacity, economy of operation.

It represents a degree of machine tool perfection that only such an organization could produce.

WILLIAM SELLERS & CO., INC., Philadelphia
Established 1848

SELLERS
MACHINE
TOOLS

Sellers Industrial Tools comprise Drill Grinders, Tool Grinders, Spiral Gear Drive Planers, Boring and Turning Mills, Floor Boring Machines, Planer Type Milling Machines, etc. Sellers Railroad Tools comprise Car Wheel Lathes, Driving Wheel Lathes, Car Wheel Borers, Driving Box Borers. Also manufacturers of Sellers Locomotive Injectors.



NILES LOCOMOTIVE AXLE JOURNAL GRINDER

is a thoroughly tried and proven machine, having shown definitely from its operation in actual service to possess many features conducive to economy. The machine is provided with an inside tool rest arranged for both turning and grinding inside journals, and it can also be arranged with a similar tool rest for the outside journals.

THE grinding of locomotive axle and trailer journals over a period of years has brought out the following items of interest:

A material increase in the life of the axle due to the savings in material when reconditioning the journals.

Greater mileage between reconditionings.

No engine failures reported from either hot boxes or failed axles.

Production greatly increased.

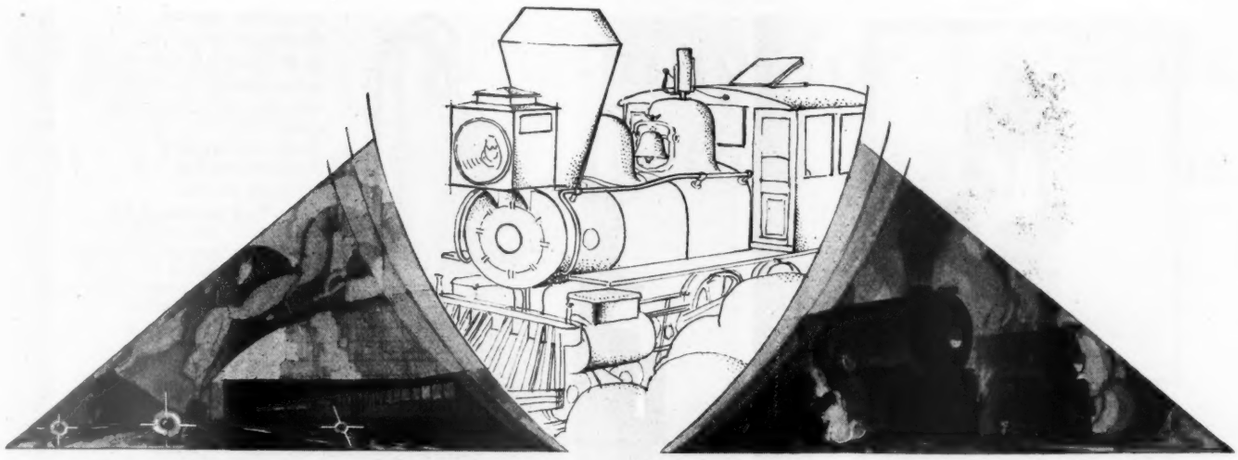
THE
Niles Tool Works Co.

THE
Putnam Machine Co.

Divisions
GENERAL MACHINERY CORPORATION
(Incorporated Delaware)
Hamilton, Ohio.

Offices in Principal Cities

Foreign Dept. Niles Bement Pond Co., N. Y. C.



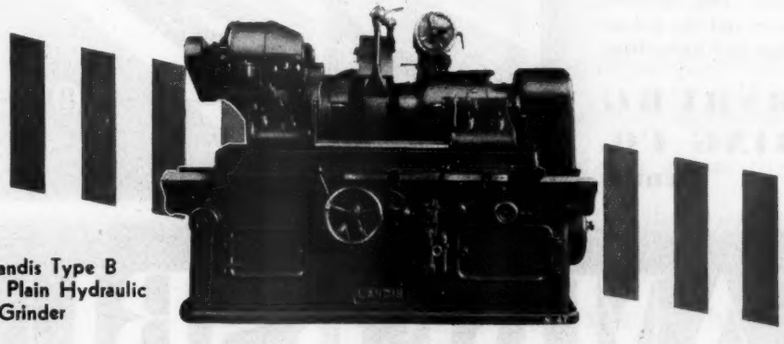
More Stack Than Engine

YOU would be astonished and amused if your pullman were to be coupled to a train with an antique engine, as pictured above, assigned to take you to your destination. Undoubtedly the trip would be anything but pleasant. Above all things it would be so slow as to be exasperating.

Great has been the progress in engine design and efficiency, within recent years. Just as great has been the progress in grinding machine design during that same period. Notwithstanding the slowness and consequent inefficiency of obsolete grinders, many yet remain in use. The reason for this continued use may be given by some as the fact that the machines are in fair mechanical condition. But they should not be used, just as locomotives built in 1915 or 1916 should not and would not be used, even though they were in good mechanical condition.

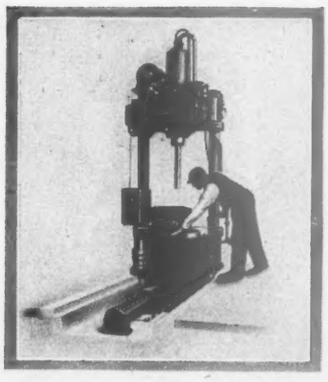
Have you ever realized that the users of obsolete grinders, or obsolete equipment of any kind for that matter, pay for modern new machines? This is true because the final selling price of any product is actually set by the competitor who makes the most of up-to-date methods and equipment.

If you use precision grinders you should be acquainted with the efficiency of modern machines as compared with that of obsolete machines. Inasmuch as you are paying for new machines, why not have them?



The Landis Type B
14"x18" Plain Hydraulic
Grinder

LANDIS TOOL CO. (92)
WAYNESBORO PA
DETROIT•CHICAGO•NEWARK•PHILADELPHIA



SPEEDY HANDLING OF BRASSES ON THE CHAMBERSBURG BUSHING PRESS

EASY, rapid handling of driving boxes to and from the Press bed give further advantages to the Chambersburg High Speed Hydro-Pneumatic Bushing Press.

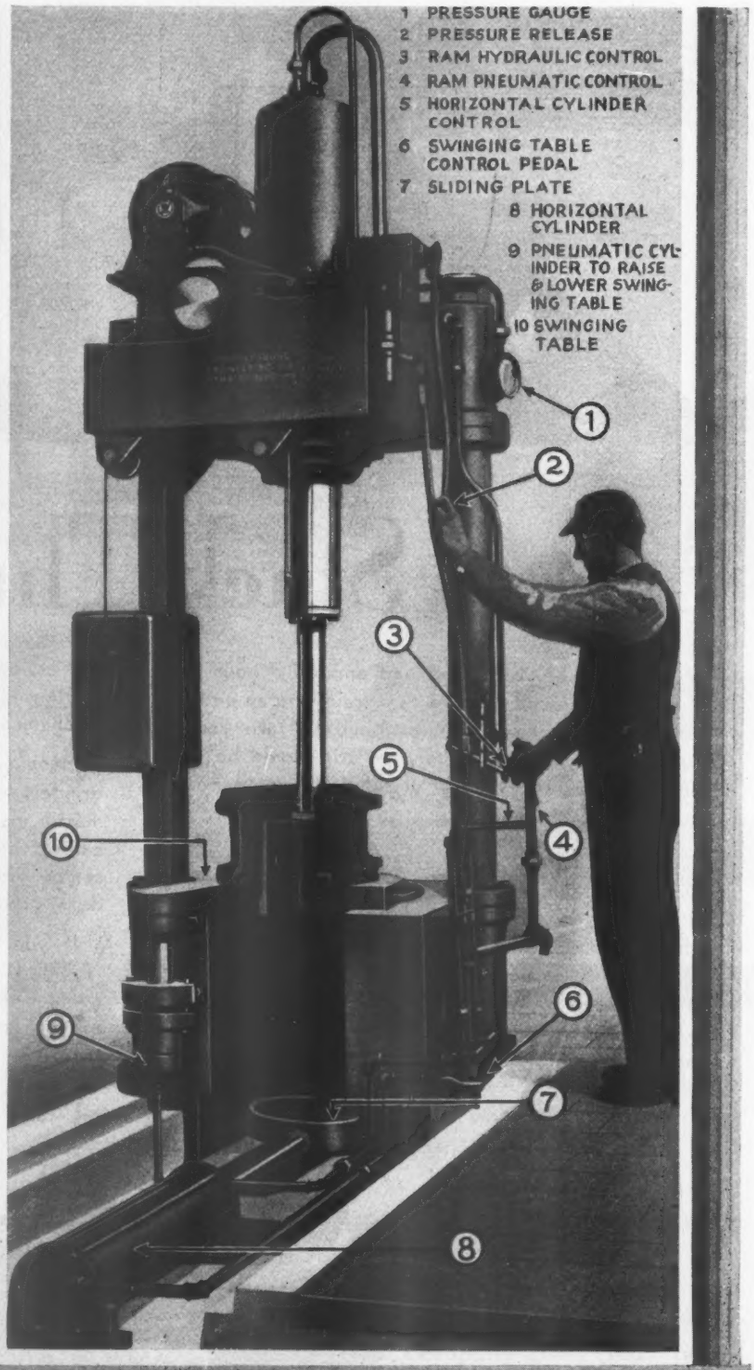
A Swinging Table, carried on roller and ball bearings, is elevated by air pressure to swing boxes between the central position under the ram and a position clear of the cap where shop hoists on crane or monorail can lift the box. During pressing operations the Swinging Table is lowered flat on the bed—also by air.

Demounted Brasses are caught on a Sliding Plate and drawn by a horizontal cylinder to a position under the same hoist.

Rods and pistons or bull rings of most sizes can be assembled, utilizing the Sliding Plate for centering under the ram and for withdrawing. With a pit under the subbase the same rods can be pressed apart.

All controls are centered. The operator need not leave his position and the helper is free to expedite loading and unloading.

CHAMBERSBURG ENGINEERING CO.
Chambersburg Penna.



CHAMBERSBURG

Sold by

CHAMBERSBURG-NATIONAL

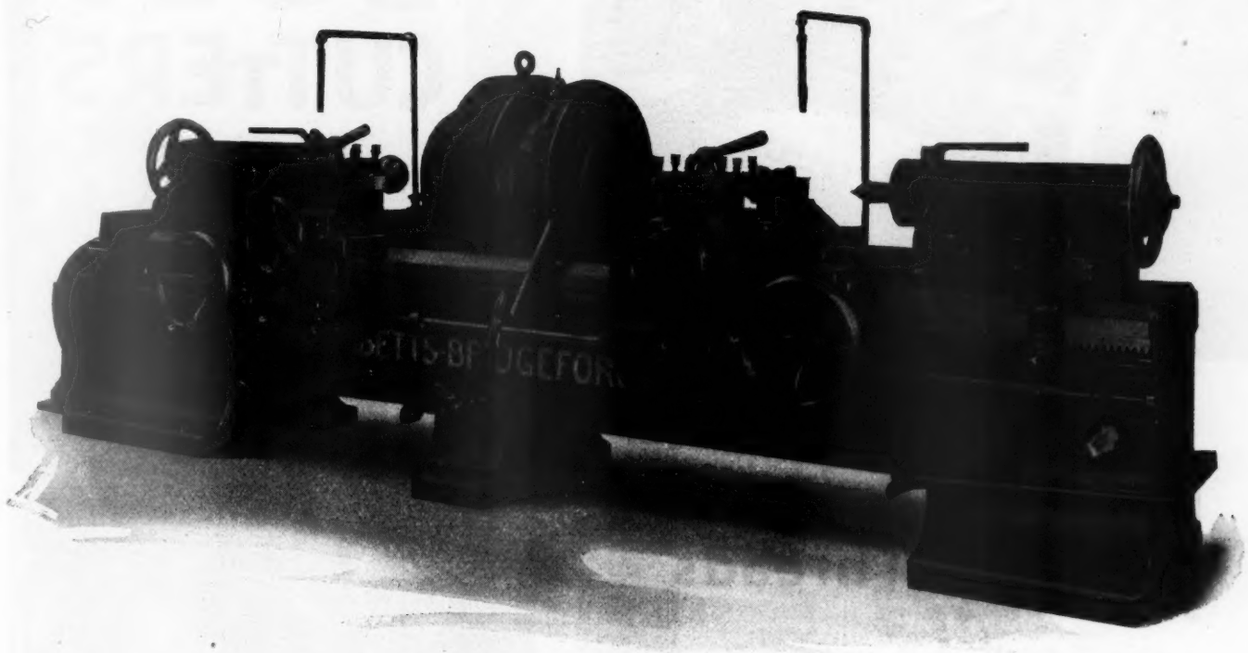
COMPLETE FORGING EQUIPMENT

CHAMBERSBURG, PA. TIFFIN, OHIO

NEW YORK, 152 W. 42nd Street CHICAGO, 565 W. Washington Street

DETROIT, 2457 Woodward Avenue

Opposed burnishing for journals on the Betts-Bridgeford Axle Lathe



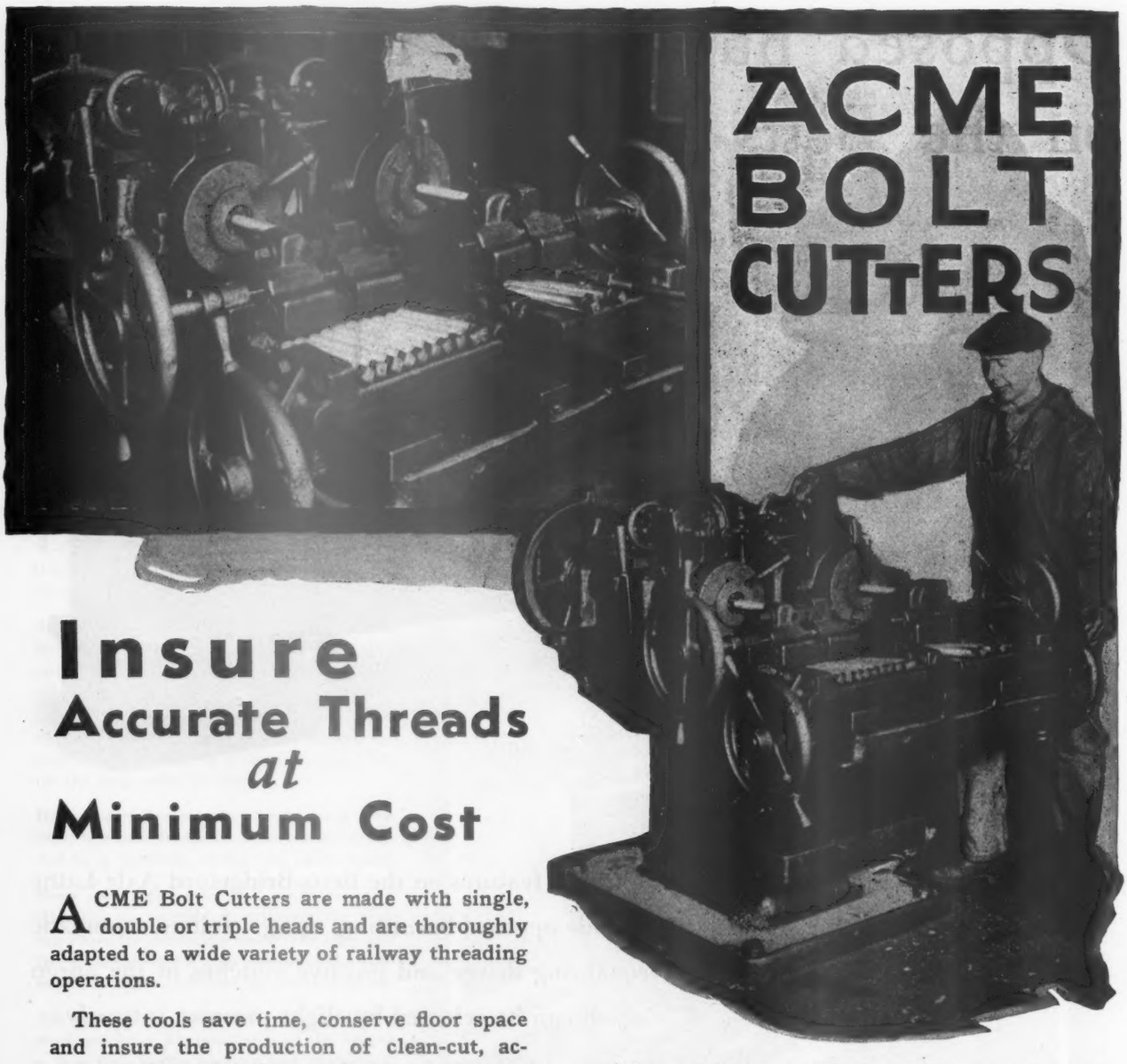
The new features on the Betts-Bridgeford Axle Lathe include opposed burnishing using 4 rollers, automatic equalizing driver and positive clutches in the apron which can be released by slight pressure instantly.

Opposed burnishing removes strain from the centers and the automatic driver shortens the setting time. The new apron clutches allow the operator to run closer to the fillet before throwing out the power feed, and all of the new features combined increase the already high production on this machine materially. Write for details on this improved lathe.

BETTS - NEWTON - COLBURN - MODERN - HILLES & JONES

CONSOLIDATED

CONSOLIDATED MACHINE TOOL CORPORATION *of* AMERICA, Rochester, N. Y.



Insure
Accurate Threads *at* Minimum Cost

ACME Bolt Cutters are made with single, double or triple heads and are thoroughly adapted to a wide variety of railway threading operations.

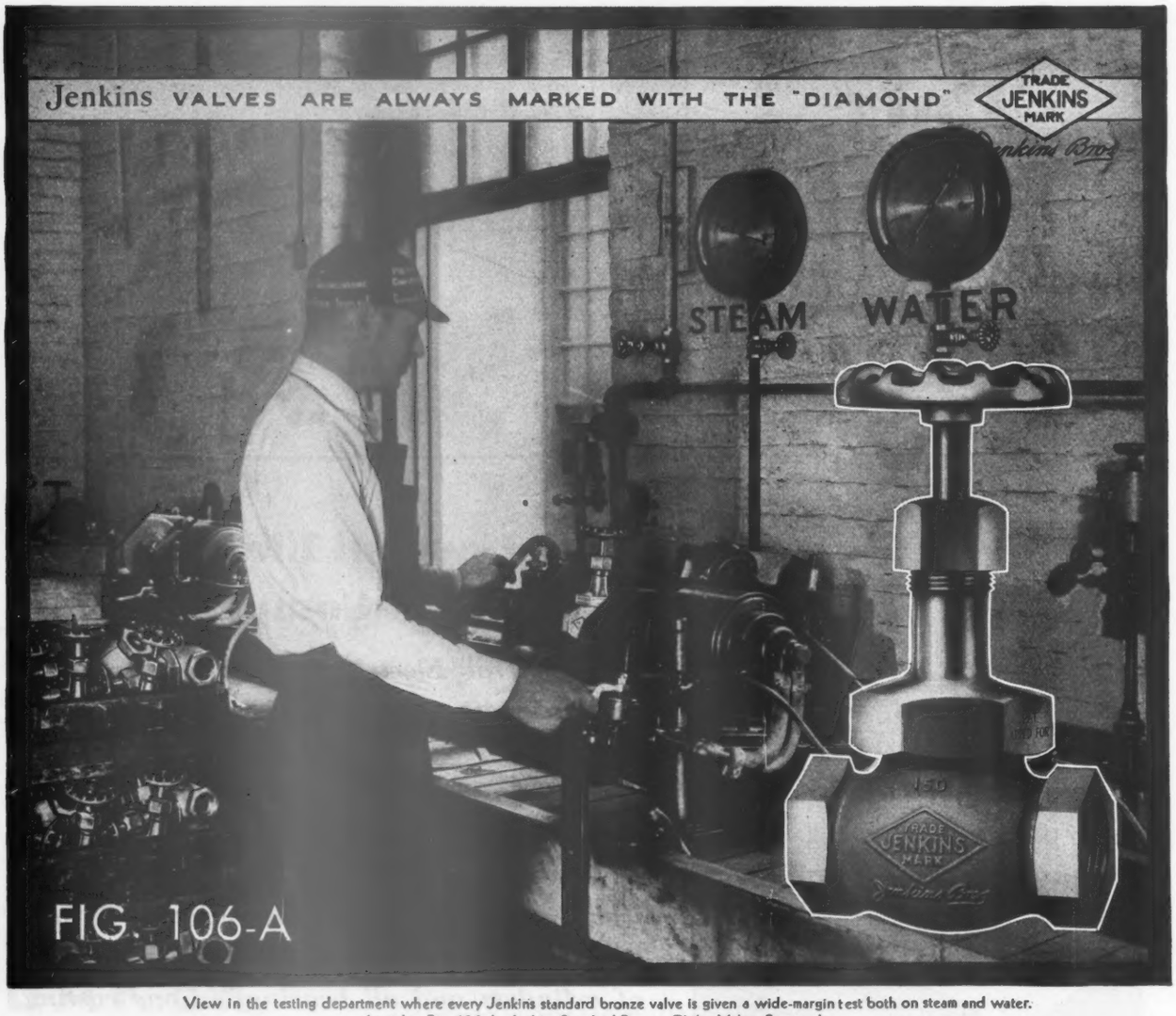
These tools save time, conserve floor space and insure the production of clean-cut, accurately threaded bolts or other screwed parts, at least possible expense for either labor, power or maintenance.

Modern Acmes have dies arranged to open automatically when the desired length of thread is cut; die changes are made quickly and die adjustments can be easily effected by means of a simple hand wheel control without stopping the machine. Taper and straight, right or left hand threads are cut with equal facility.

Hollow spindles—carriages with long wearing surfaces—and the various time-saving conveniences embodied in this machine are of indispensable value for the rapid and economical threading of innumerable details. For railway shop purposes, the modern Acme Bolt Cutter is unsurpassed.

Send for the Acme Catalogue

The Acme Machinery Company
Cleveland, Ohio



View in the testing department where every Jenkins standard bronze valve is given a wide-margin test both on steam and water. At right: Fig. 106-A, Jenkins Standard Bronze Globe Valve, Screwed.

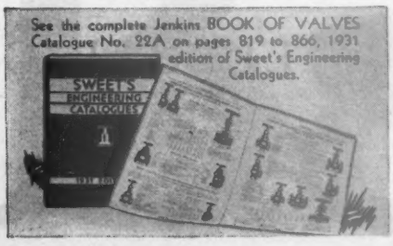
EVERY VALVE is Tested— not just an occasional one

EVERY Jenkins Standard Bronze Globe, Angle, Cross and Check Valve is tested before it is shipped from the factory. It is made to demonstrate by a wide margin that it is tight and stays tight under the pressure for which it is rated.

This test is carried out not only with water pressure, BUT ALSO WITH STEAM. It gives a final check on all elements of design and construction. It guarantees proper mechanical operation and freedom from flaws. It is a service which Jenkins renders to the purchaser as assurance of reliable performance.

The testing plant in the Jenkins Factory is staffed with competent men whose responsibility is to see that all Jenkins Valves pass the Jenkins wide-margin test. Obtainable at your supply house.

In writing us direct, ask for Form 141.

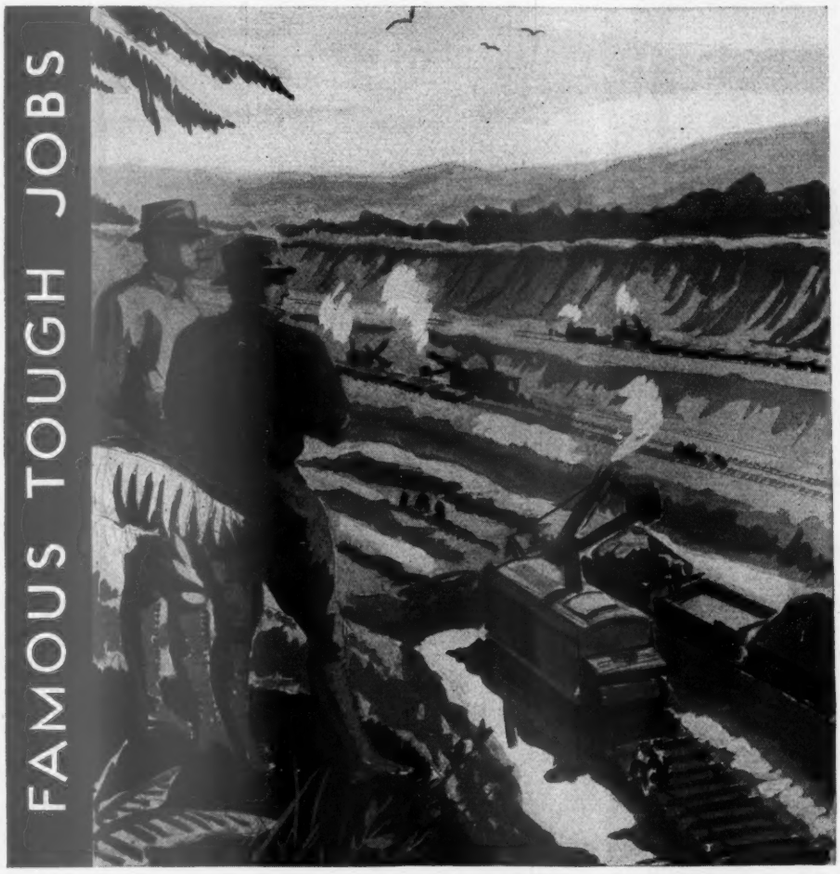


◆

JENKINS BROS.

80 White St., New York, N. Y.; 524 Atlantic Avenue, Boston, Mass.; 133 No. Seventh St., Philadelphia, Pa.; 646 Washington Blvd., Chicago, Ill.; 1121 No. San Jacinto, Houston, Texas. JENKINS BROS., Limited, Montreal, Canada; London, Eng. Factories: Bridgeport, Conn.; Elizabeth, N. J.; Montreal, Canada

Jenkins
BRONZE IRON STEEL
VALVES
Since 1864



DIGGING THE PANAMA CANAL

In the malaria infested swamps of Panama, under every condition hostile to human life and achievement, a small army of persistent, daring engineers and workmen dug the Panama Canal—a feat that is still one of the wonders of the modern world. They did a tough job well.

FOR EXTREME PRESSURES

GARLOCK 7021 Compressed Asbestos Sheet Packing is no stranger to tough jobs. It packs hundreds of them daily on pipe lines and on equipment handling gasoline, oil, steam and gases at extreme temperatures and pressures. Garlock 7021 is at home in the big refineries and power plants—in the process industries—in the oil and gas fields—and in every other industrial operation where flanged joints must be securely and permanently packed.

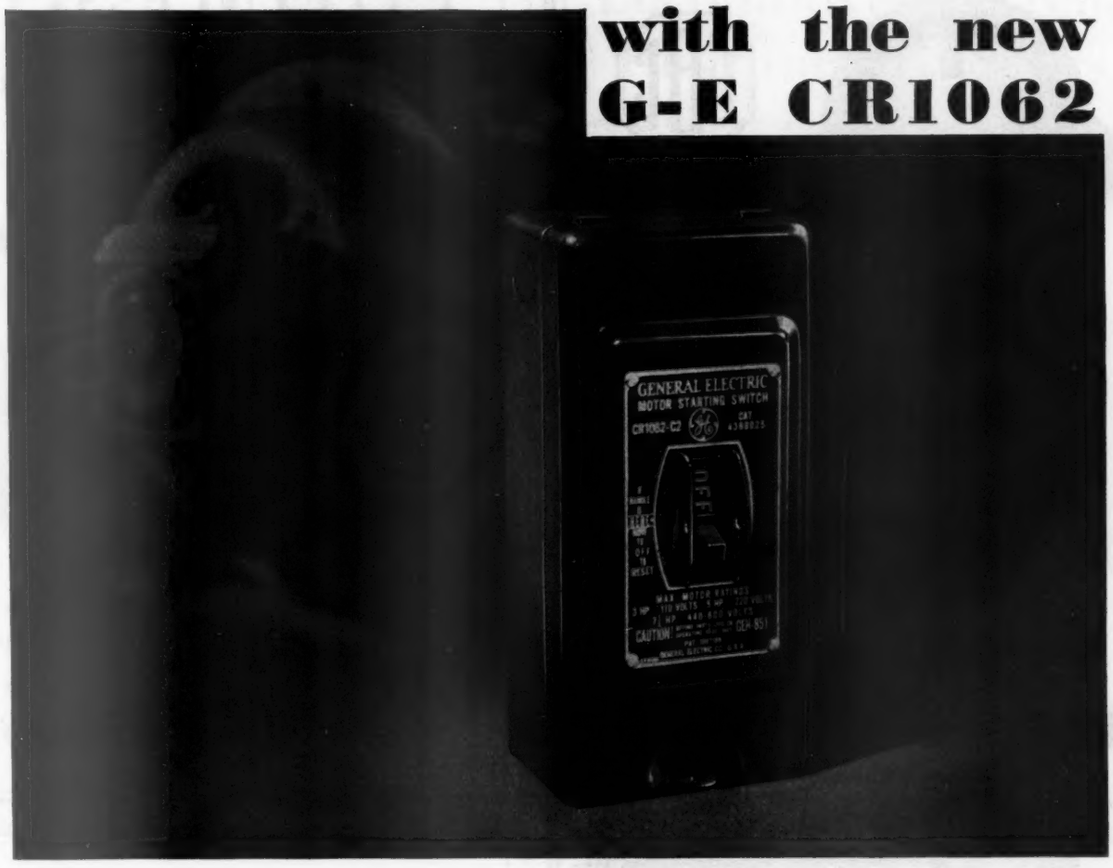
Garlock 7021 is a remarkable asbestos sheet packing. It will relieve you of your tough gasketing problems.

THE GARLOCK PACKING COMPANY
PALMYRA, NEW YORK
A World Wide Organization with Offices and Warehouses in All Principal Industrial Centers

FOR GASOLINE, OILS, STEAM AND GAS

GARLOCK

START RIGHT with the new G-E CR1062



The new G-E CR1062 manually operated motor-starting switch . . . good to look at both inside and out . . . mechanically and electrically correct . . . perfect partner in any combination that includes a small induction motor

AN a-c. motor-starting switch that's reliable ... simple ... easily wired ... yet inexpensive

In the new manually operated CR1062 motor-starting switch with hand-reset thermal overload device, General Electric offers you a switch that is not only moderately priced but easy and inexpensive to install. It is designed for full-voltage starting of small induction motors. It is good to look at. Built in a finely proportioned case with rounded corners, the CR1062 harmonizes with the lines of your most prized installation.

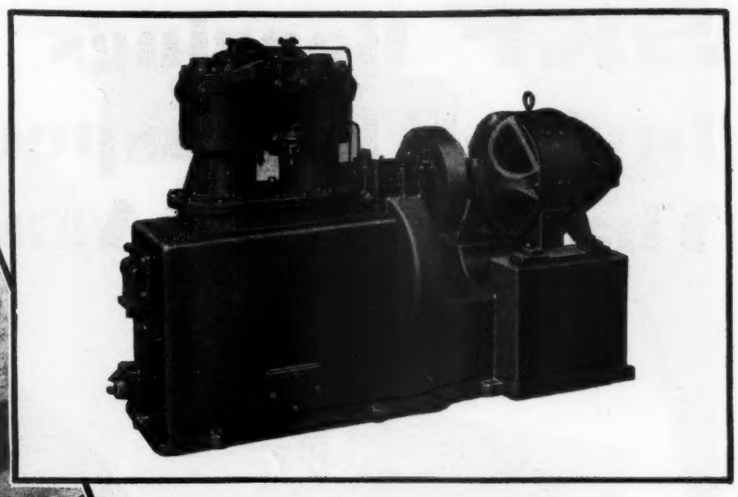
Not only does the simplicity of this new switch contribute to ease of inspection, it adds materially to its operating life. These and other features make the CR1062 of interest to you. Why not ask your nearest G-E sales office for a copy of publication GEA1522, which gives complete details?

301-92

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

The Hand Pump and its SUCCESSOR



A wide variety of types and sizes comprise the line of Westinghouse air compressors—suitable for train charging and testing, operation of signals, interlock plants, electro-pneumatic car retarders, shop tools—or for any other pneumatic requirement in railroad yards and shops.

MANY "old timers" will recall "away back when" a hand pump was used to provide air pressure for testing brakes in car yards . . . This device was an important piece of equipment in railroad terminals for many years. It has long since passed out of the picture and something more adequate has taken its place . . . Nowadays the brake tester has at his disposal a yard air line supplied by a power driven compressor having a capacity many times that of its little forerunner.

Modern conditions in car yards demand a compressor outfit for charging long trains as well as for making tests on individual cars. Westinghouse motor driven air compressors are being used by many railroads for this purpose. They are efficient, economical, durable—having a reputation for reliable trouble-free service year after year . . . When you need a good air compressor—remember the Westinghouse.

WESTINGHOUSE AIR BRAKE COMPANY

General Office and Works » » » **WILMERDING, PA.**

SKF Bearings Invite The Inspection That Guards Against Trouble

WHILE SKF Journal Bearings have run over a million miles without trouble it is always good practice to inspect any bearing when equipment is shopped.

If this inspection involves tearing everything down it is likely to be passed by.

Realizing the importance of easy inspection as an aid to maintenance, SKF designed its journal bearing to permit thorough inspection of every element with a minimum of trouble.

Just remove a few bolts and take off the journal box by hand. Both races and all the rollers can then be minutely examined without disturbing the mounting of the bearing on the journal. The bearing itself can be removed by unscrewing the locking nut and withdrawing the tapered sleeve.

Even on the engine truck, the inboard bearing can be quickly inspected by loosening a few bolts and removing the lower half of the journal box.

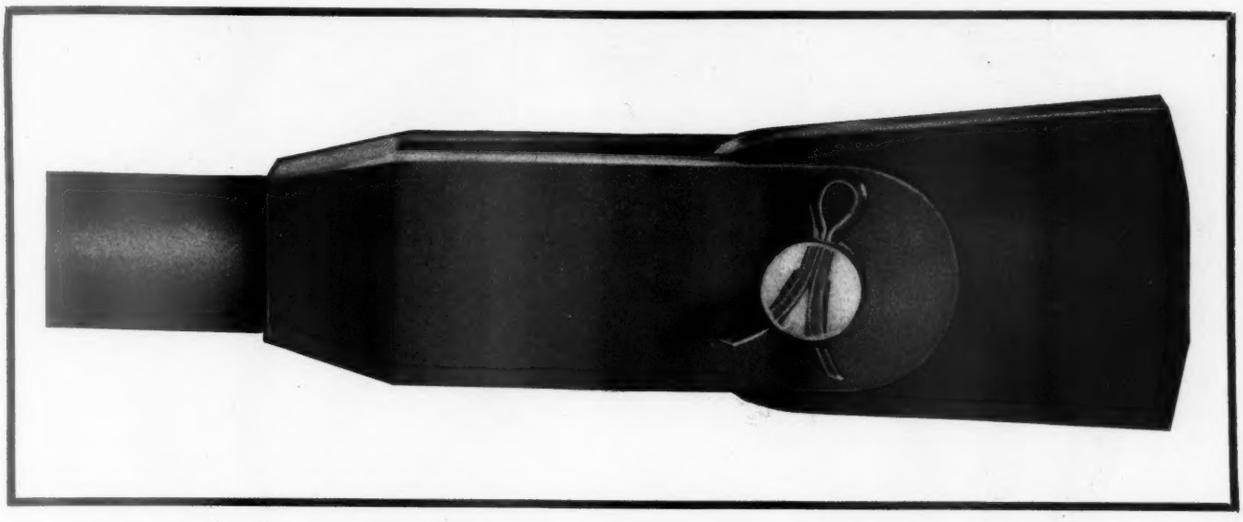
This ready accessibility of SKF Journal Bearings encourages the thorough inspection that keeps you assured of freedom from bearing trouble on the road.

2815

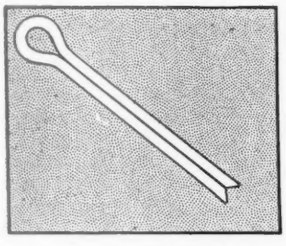
SKF Journal Bearings

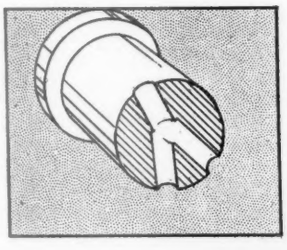
SKF INDUSTRIES INCORPORATED

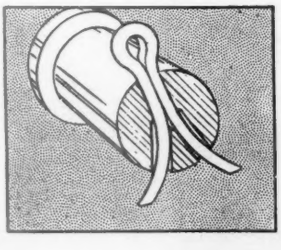
40 EAST 34th STREET NEW YORK, N. Y.



COOKE PATENTED PIN *and* COTTER







Self-OPENING — Self-RETAINING

THE accompanying illustrations show that the Cooke Cotter is an ordinary cotter with the prongs forming an internal "V" for easy spreading and the pin or *bolt* bored with a "Y" shaped hole. The cotter is simply inserted in the proper hole and tapped lightly with a hammer. The first tap spreads the prongs of the cotter on the wedge formed by the intersection of the two lower holes. Further taps drive the cotter home, spreading the prongs at a wide angle and binding them tightly against the sides of the "Y" shaped hole, locking the cotter firmly and thus eliminating vibration and the resulting wear. No additional bending of the cotter prongs is necessary. The "Y" shaped hole is provided with shoulders above the wedge which prevent the cotter from entering any except the right hole, thereby making it fool proof. These shoulders also wedge the prongs by tending to create an "S" curve. A Cooke Cotter will never work loose, even under the most severe vibrations.

AMERICAN RAILWAY PRODUCTS COMPANY, INC.

GEORGE T. COOKE, *President*

74 Washington Street South Norwalk Connecticut

Deliver The Goods

CARS equipped with WINE DOOR LOCKS can always be depended upon to deliver full ladings. There are no losses in transit. No dribbling away of revenue freight along the right of way.

The more cars you equip the lower your claims for loss of lading.

The Wine Railway Appliance Co.

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WINE DOOR LOCKS

"The Simplest of All Door Mechanisms"

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S. K. F. Industries

Bearings, Ball.
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S. K. F. Industries

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Bearings, Center.
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S. K. F. Industries.
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American Steel Foundries.
Chicago Ry. Equipment Co.
O. & C. Co., The.
Wine Railway Appliance Co.

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Timken Roller Bearing Co.

Bearings, Thrust.
S. K. F. Industries.
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Beds, Cast Steel, Locomotive.
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Betts Works of Consolidated Mach. Tool Corp. of America.
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Niles Tool Works Co., The

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Colburn Mach. Tool Works of Consolidated Machine Tool Corp. of America.
Niles Tool Works Co., The
Sellers & Co., Inc., Wm.

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Niles Tool Works Co., The

Drilling Machines, Portable, Electric.
Independent Pneumatic Tool Co.

Drilling Machines, Portable, Pneumatic.
Independent Pneumatic Tool Co.
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Drilling Machines, Radial.
Cleveland Punch & Shear Works Co.
Niles Tool Works Co., The
Sellers & Co., William.

Drilling Machines, Rail.
Colburn Mach. Tool Works of Consolidated Machine Tool Corp. of America.
Newton Works of Consolidated Machine Tool Corp. of America.
Niles Tool Works Co., The
Sellers & Co., Inc., Wm.

Drilling Machines, Rock.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Vertical.
Colburn Mach. Tool Works of Consolidated Machine Tool Corp. of America.
Sellers & Co., Inc., Wm.

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Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Drills, Close Corner.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Drills, Core.
Ingersoll-Rand Co.

Drills, Pneumatic.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

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Ingersoll-Rand Co.
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Feedwater Heaters, Stationary.
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Hammers, Drop.
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Hammers, Forging.
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Ingersoll-Rand Co.

Hammers, Pneumatic Forging.
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Sellers & Co., Inc., Wm.

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Newton Works of Consolidated Machine Tool Corp. of America.
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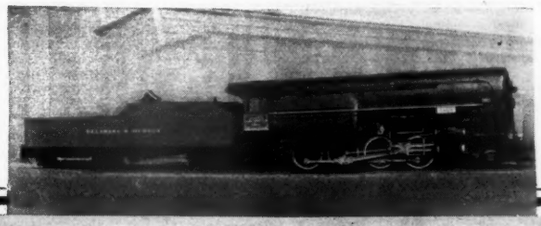
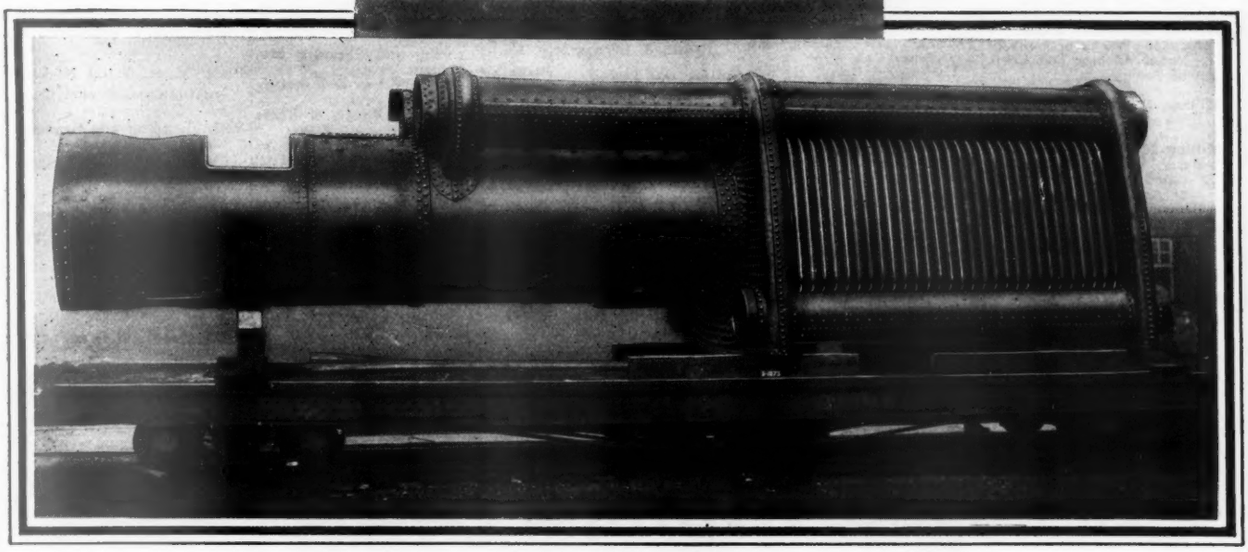
Rooksby Co., E. J.
Underwood Corp., H. B.

Milling Machines, Portable Frame Jaw.
Micro Machine Co.

Dependable materials are the best assurance of dependable performance



New D & H Locomotive "James Archbald", (left) showing Nickel Steel connecting rods, manufactured by AMERICAN LOCOMOTIVE CO., Schenectady, N. Y. and (below) boiler shell, with Nickel Steel plates and tubes.



Nickel Steel helps increase working efficiency of the new D & H LOCOMOTIVE

THE new locomotive recently completed by the American Locomotive Co. for the Delaware and Hudson Railroad was designed to give the maximum hauling capacity and operating efficiency within permissible design limitations. To attain this end it was necessary to construct the engine of the toughest and most dependable materials available, hence Nickel Steel was used for the driving axles, connecting rods, piston rods and similar parts.

Another outstanding feature is the boiler pressure of 500 lbs., the maximum developed in this country to date. While special high tensile steel was used throughout the boiler proper, it is noteworthy that Nickel Steel was specified for the plates exposed to severe heat, and for the more important tubes.

Nickel Steel is ideal boiler material, because of its strength at high temperatures and its resistance to aging and embrittlement. These qualities have been fully tested both in laboratories and in actual service on the leading railroads of this country and Canada. Likewise, the rapidly increasing use of Nickel Steel for locomotive running gear forgings testifies to its highly satisfactory properties in those applications.

Nickel
FOR ALLOY STEEL

Nickel Alloy Steel Parts in D & H LOCOMOTIVES

Low Carbon Nickel Steel Forgings:
- Driving axles
- Engine truck axles
- Crank pins
- Connecting rods
- Piston rods
- Eccentric rods
- Rod straps
- Radius bar
- Radius bar lifter
- Comb. lever and jaw
- Valve stem
- Comb. link
- Feed water pump levers and connecting rods

Nickel Steel Tubing:
- 5½" diameter boiler flues; 2" diameter tube

Nickel Steel Bolts:
- All bolts from cylinder saddle to boiler proper

Nickel Steel Plates:
- Rear Steam drum
- Bottom water drum

Other Nickel Alloy Parts

Nickel Brass Castings:
- Misc. castings subjected to super-heated steam

Ni-Iron Castings:
- Receiver pipes

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Underwood Corp., H. B.

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Brown & Sharpe Mfg. Co.

Screw Machines, Plain and Hand.
Brown & Sharpe Mfg. Co.

Screw Machines, Wire Feed.
Brown & Sharpe Mfg. Co.

Shafting, Steel Tubing.
National Tube Co.

Shapers
Consolidated Machine Tool Corp. of America.

Shapes, Structural.
Carnegie Steel Co.

Shearing Machines, Angle.
Cleveland Punch & Shear Works Co., The.
Hilles & Jones Works of Consolidated Mach. Tool Corp. of America.

Shearing Machines, Bar Iron.
Chambersburg Engineering Co.
Cleveland Punch & Shear Works Co., The.
Hilles & Jones Works of Consolidated Mach. Tool Corp. of America.

Shearing Machines, Bevel.
Cleveland Punch & Shear Works Co., The.
Hilles & Jones Works of Consolidated Mach. Tool Corp. of America.

Shearing Machine, Gate.
Cleveland Punch & Shear Works Co., The.
Hilles & Jones Works of Consolidated Mach. Tool Corp. of America.

Shearing Machines, Plate.
Cleveland Punch & Shear Works Co., The.

Shears, Plate, Sheet-Metal Rotary.
Hilles & Jones Works of Consolidated Mach. Tool Corp. of America.

Sheets, Annealed, Black, Ca: Roofing and Siding Galvanized, Iron and Steel Locomotive Jacket, Polished or Planished Iron.
Armco Railroad Sales Co.

Sheets, Monel Metal Nickel
International Nickel Co.

Sheets, Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.

Signal Pipe, Wrought Steel
National Tube Co.

Skid Shoes, Rail
Q. & C. Co., The.

Slag, Blast Furnace.
Carnegie Steel Co.

Slotting Machinery, Frame
Betts Machine Co.
Niles Tool Works Co., The
Sellers & Co., Inc., Wm.

Slotting Machines.
Betts Works of Consolidated Machine Tool Corp. of America.
Newton Works of Consolidated Machine Tool Corp. of America.
Niles Tool Works Co., The
Sellers & Co., Inc., Wm.

Small Tools.
Cleveland Punch & Shear Works Co., The.

Snow Melting Device.
Q. & C. Co., The.

Snow Plows.
Q. & C. Co., The.

Soldering Irons, Acetylene.
Oxweld Railroad Service Co.

Spark Arresters.
Locomotive Firebox Co.

Special Machinery.
Betts Works of Consolidated Machine Tool Corp. of America.
Lucas Machine Tool Co.
Newton Works of Consolidated Machine Tool Corp. of America.
Niles Tool Works Co., The
Underwood Corp., H. B.

Splice Bars, Angle.
Bethlehem Steel Co.
Carnegie Steel Co.

Spring Plates and Seats
National Malleable & Steel Castings Co.

Spring Shop Machinery
Watson-Stillman Co.

Springs.
Baldwin Locomotive Works, The.

Squares, Combination.
Brown & Sharpe Mfg. Co.

Staybolt and Bolt Turning Threading Machines.
Consolidated Machine Tool Corp. of America.

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Bethlehem Steel Co., Inc.
Burden Iron Co.

Staybolt Drivers.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.

Staybolt, Steel.
Bethlehem Steel Co., Inc.
Burden Iron Co.

Staybolt Taps.
Flannery Bolt Co.

Staybolt Testers, Flexible (Elect. Contact).
Flannery Bolt Co.

Staybolts
American Locomotive Co.
Bethlehem Steel Co.
Flannery Bolt Co.

Stay Tubes.
National Tube Co.

Steam Chests.
Franklin Ry. Supply Co.

Steel, Alloy
Bethlehem Steel Co.
Carnegie Steel Co.
Central Alloy Steel Co., The
S. K. F. Industries.
Timken Roller Bearing Co.

Steel, Carbon.
Bethlehem Steel Co., Inc.
Carnegie Steel Co.
S. K. F. Industries.
Timken Roller Bearing Co.

Steel, Die.
Bethlehem Steel Co., Inc.
S. K. F. Industries.
Timken Roller Bearing Co.

Steel Firebox.
Bethlehem Steel Co.
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Bethlehem Steel Co.

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Timken Roller Bearing Co.

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Bethlehem Steel Co., Inc.

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Bethlehem Steel Co.
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Steel, Tool.
Bethlehem Steel Co., Inc.
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Geometric Tool Co.
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National Tube Co.

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Brown & Sharpe Mfg. Co.

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Locomotive Firebox Co.

Tables, Welding.
Oxweld Railroad Service Co.

Tank Work.
Baldwin Locomotive Works, The.

Tanks, Acetylene.
Oxweld Railroad Service Co.

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Acme Machinery Co., The
Geometric Tool Co., The.

Taps, Collapsing.
Geometric Tool Co., The
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Testers, Boiler.
Sellers & Co., Inc., Wm.

Testing Machines, Gear Tooth.
Brown & Sharpe Mfg. Co.

Thread Cutting Machines, Bolt.
Acme Machinery Co., The

Threading Machine, Automatic.
Brown & Sharpe Mfg. Co.

Threading Machine, Bolt and Stud.
Geometric Tool Co., The

Ties, Steel.
Bethlehem Steel Co., Inc.
Carnegie Steel Co.

Tools, Boilermakers'
Ingersoll-Rand Co.

Tools, Boring Mill.
O. K. Tool Co.

Tools High Speed Steel.
Bethlehem Steel Co., Inc.

Tools, Inspection.
Brown & Sharpe Mfg. Co.

Tools, Lathe.
O. K. Tool Co.

Tools, Machinists'
Brown & Sharpe Mfg. Co.

Tools. Threading (See also Dies, Threading, Self Opening).

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Baker-Raulang Co.

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Trucks, Car and Locomotive
American Steel Foundries
General Steel Castings Corp.
Franklin Ry. Supply Co.

Trucks, Cast Steel, Car & Locomotive.
American Steel Foundries
General Steel Castings Corp.

Trucks, Electric.
American Locomotive Co.
Baldwin Locomotive Wks., The

Trucks, Frame, Cast Steel.
American Steel Foundries
General Steel Castings Corp.

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Baker-Raulang Co.

Trucks, Trailer.
Franklin Ry. Supply Co.
General Steel Castings Co.

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Armco Railroad Sales Co.
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National Tube Co.

Tubes, Charcoal Iron.
Bethlehem Steel Co.

Tubes, Nickel.
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General Electric Co.

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General Steel Castings Co.

Underframes, Tender, Cast Steel.
General Steel Castings Co.

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Walworth Co.

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Lunkenheimer Co.

Valves Blower and Blow Off
Ashton Valve Co.
Lunkenheimer Co.
Walworth Co.

Valves, Bypass.
Lunkenheimer Co.

Valves, Drifting.
Franklin Ry. Supply Co.

Valves, Gate.
Lunkenheimer Co.
Walworth Co.

Valves, Globe.
Jenkins Bros.
Lunkenheimer Co.
Walworth Co.

Valves, Hydraulic.
Chambersburg Engineering Co.
Lunkenheimer Co.
Walworth Co.
Watson-Stillman Co., The

Valves, Injector Check and Angle Steam.
Sellers & Co., Inc., Wm.

Valves, Piston.
Franklin Ry. Supply Co.

Valves, Pop. Safety and Relief
Ashton Valve Co.
Lunkenheimer Co.

Valves, Rubber Pump.
Garlock Packing Co., The

Valves, Shop Air Line.
Cleveland Pneumatic Tool Co.
Lunkenheimer Co.
Walworth Co.

Valves, Throttle.
Lunkenheimer Co.

Valves, Water.
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Brown & Sharpe Mfg. Co.

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National Machinery Co., The

Washers, Lock.
National Malleable & Steel Castings Co.

Washers & Testers, Boiler.
Sellers & Co., Wm., The.

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Oakite Products Inc.

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Lunkenheimer Co.

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Dearborn Chemical Co.

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Dearborn Chemical Co.

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Franklin Ry. Supply Co.

Wedges, Journal Box.
National Malleable & Steel Castings Co.

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Oxweld Railroad Service Co.

Welding Gloves.
Oxweld Railroad Service Co., The.

Welding Goggles.
Oxweld Railroad Service Co., The.
Willson Products Co., Inc.

Welding Helmets & Shields.
Willson Products Co., Inc.

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General Electric Co.
Westinghouse Elec. & Mfg. Co.

Welding, Oxy-Acetylene Machines.
Oxweld Railroad Service Co., The.

Welding Rods and Wire.
Oxweld Railroad Service Co., The.

Welding Supplies.
Oxweld Railroad Service Co., The.

Wheel Centers, Driving.
American Steel Foundries.
General Steel Castings Corp.

Wheels, Car and Locomotive
Bethlehem Steel Co.
Carnegie Steel Co.
Lima Locomotive Works.

Wheels, Mine Cars.
Bethlehem Steel Co., Inc.
Carnegie Steel Co.

Wheels, Steel.
American Steel Foundries
Bethlehem Steel Co., Inc.
Carnegie Steel Co.

Wheels, Wrought Steel.
Armco Railroad Sales Co.

Whistles, Locomotive.
Ashton Valve Co.
Lunkenheimer Co.

Wire, Fencing
Bethlehem Steel Co., Inc.

Wrenches, Chain, Monkey, Pipe.
Walworth Co.

Wrought Iron.
Highland Iron & Steel Co.

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